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Number 12
February 1988
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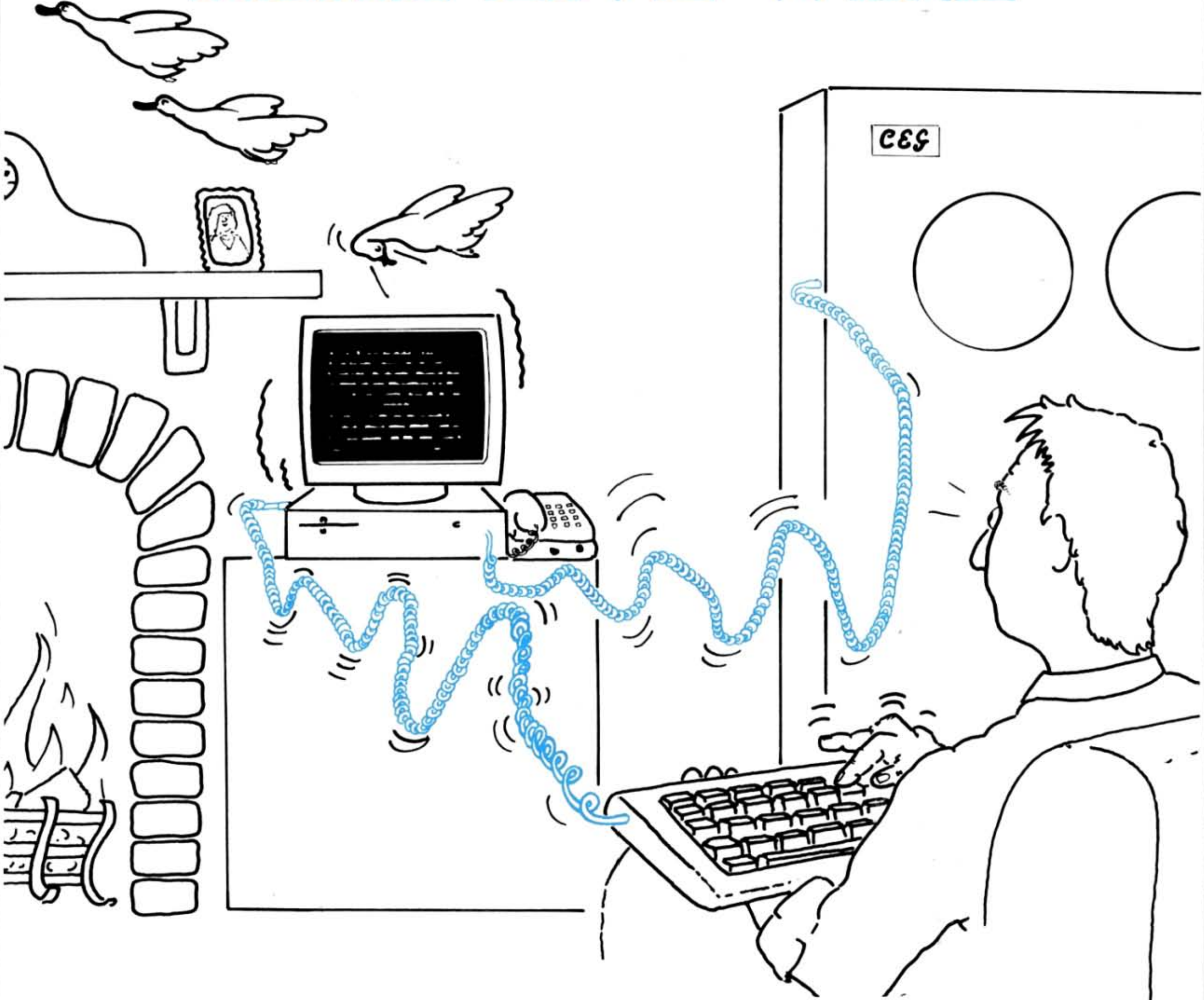

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THE
MICRO
USER
INNOVATION AWARD

The amazing things you can do with a BBC Micro

At last – the result of *The Micro User* 1988 Innovation Award, with reports on some of the most outstanding entries. Turn to Page 134.

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Memory backup and more programs
GRAPHICS
3D Spaceship

THE MICRO USER
March 1988 issue on sale February 3

MICRO USER CLASSIFIEDS
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THE MICRO USER NEWS

Acorn concentrates on Risc technology

ACORN says a much fitter, leaner organisation will emerge from its sudden trimming of employees and projects.

The company laid off 49 technical and support staff in what it described as "a withdrawal from creating custom-made products for individual end users".

This means an end to Acorn involvement in expensive endeavours aimed at limited areas of the marketplace.

Instead, the company "is to reorganise its resources so as to take advantage of the positive market reaction to its 32-bit Risc technology.

"The prime focus will continue to be the scientific and education markets, the areas of its greatest strength and where it sees many development opportunities", said an Acorn statement. The company says custom-made products have not brought the return on investment Acorn was looking for.

In announcing what was termed the streamlining of the company's activities, chairman Bruno Soggiu said the decision to concentrate on volume products – particularly those based on Acorn's 32 bit technology – made sound commercial sense.

He added: "The Archimedes range of high-performance computer systems has been well received in the UK and in international territories where we have started to sell it.

"Similarly, the news that we will have a range of Unix-based workstations on the market next year has aroused a lot of serious interest in the tertiary and higher-education sectors as well as the wider scientific community in industry and commerce.

"We are also confirming our commitment to research and development by further enhancing our Risc chip architecture.

"These moves will allow us to reaffirm our leadership in the UK education market and to build on the reputation we have of providing quality products".

Acorn spokesman Michael Page told *The Micro User*: "Few of the people who have gone are technical, most were support staff.

"By putting more effort into the education and scientific areas we will significantly strengthen the company".

YORKSHIRE sysop Craig Evenson has developed his own commercial bulletin board software for the BBC Micro and Master.

Called EBBS, it works in both viewdata and scrolling Ascii modes. Also included are four methods of file transfer including Xmodem and Prestel methods. Price is £25.

Craig (0274 544409) used EBBS software to set up his own bulletin board which can be contacted on 0274 541156, 24 hours a day, 300/300 or 1200/75 bauds, 8N1 or 7E1.

The Master automation

A BBC Master is at the heart of a the latest advance in industrial automation.

Mascot is an intelligent workstation from Robotas (0474 879643) for light mechanical or electronic assembly work.

The BBC Master guides the operator step by step through the assembly sequence, moving on at the press of a foot pedal.

Material needed at each point is presented on motorised carousels or gravity-fed dispensers, and the quantity to pick is displayed.

The place where the part must be installed is indicated by a low-power laser beam.

Digitised pictures with text and pointers appear on the screen to convey important information such as torque settings.

Programs are written or edited online with a simple system of menus – permitting fast implementation of design changes.

INTERNATIONAL DRIVE

EDUCATION software specialist Logotron will be exhibiting a variety of products illustrating its international business links when it attends Didacta 88, the world education equipment fair in Switzerland in February.

On show will be an MSdos version of Logotron Logo, Logo for the Archimedes, PenDown junior word processing system and low-price personal productivity software.

Logotron (0223 323656) now supplies Logo to run on the Archimedes, taking full advantage of the high-speed processing power of the 32-bit Risc processor.

Archimedes Logo has all the features of a mainframe version, including a powerful debugging environment, and the largest Logo workspace to be found on a micro.

PenDown junior word processing system was designed specifically for children and consists of a group of programs – PenDown Utilities, Toolbox, Adventure Writer and Extra 1&2.

Both Logotron Logo and PenDown have found success in Italy where they are supplied to Olivetti Prodest for the Italian version of the Acorn Compact.

The 8 in 1 and 1295 Series are ranges of the personal productivity software which have emerged from Logotron's collaboration with Spinnaker Software in America.

The 8 in 1 comprises word processor, spreadsheet, database, outliner, spellchecker, graphics, communications and desktop accessories for £49.95. The 1295 Series comprises word processor, spreadsheet and database, each costing £12.95.

A GRAPHICS adventure for the BBC Micro called Inferno comes from Oxford-based Vanadis Software. Two reversible disc include pictures, puzzles, pages of compressed text and a selection of mazes. The product costs £14.95.

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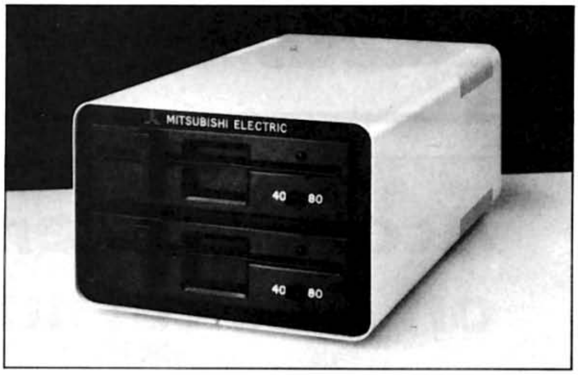

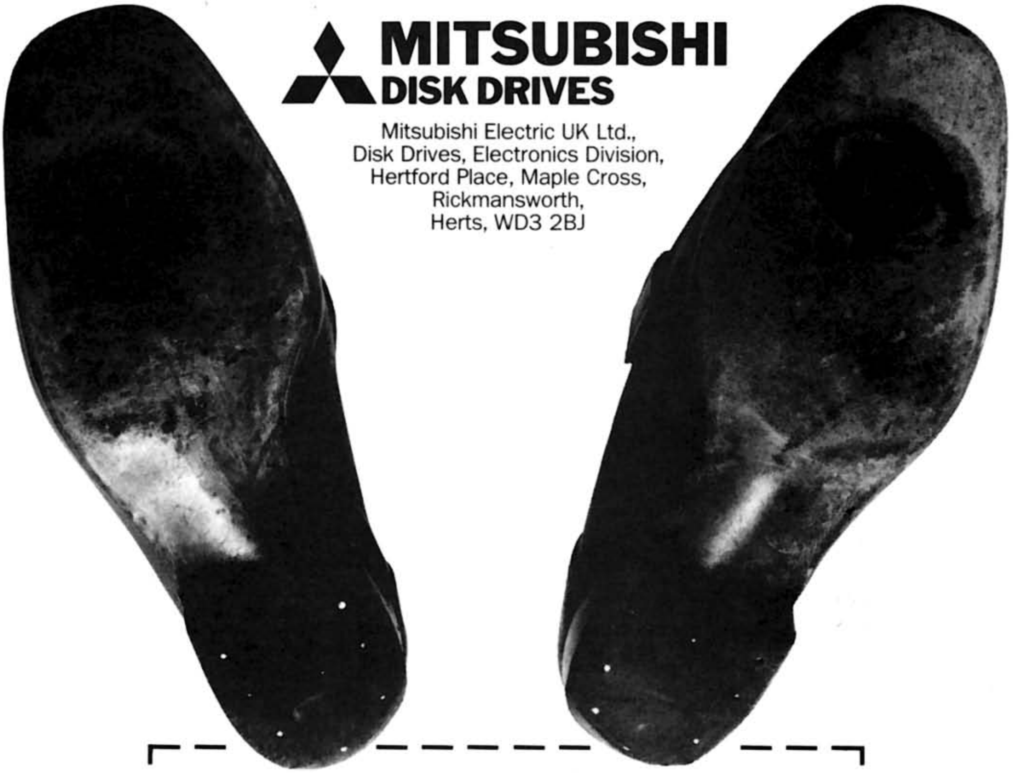

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NEWS

WIZARD SHOW IS DUE IN NORTH

DRAGON-slaying wizards, maidens in distress and the Spirit of Adventure group will travel through time to transform the next Electron and BBC Micro User Show into an exciting world of adventuring.

Goblins, demons, and all manner of mythical creatures have been taken out of the micro chip games world and brought to life.

The Spirit of Adventure group, who meet regularly to act out medieval quests, will be at the Renold Building, UMIST, Sackville Street, Manchester, from March 18 to 20 disguised as minotaurs, zombies, wizards and goblins.

Visitors will have the chance to play the hero or heroine, battling against magical forces and monsters, under the guidance of some of Britain's top role-playing specialists.

The very latest in hardware and software will also be on display and, in keeping with the adventure theme, a treasure hunt is being held with prizes of the most popular fantasy games for the BBC Micro and Electron.

An advice centre manned by experts will be available to help find solutions to some of the more complicated quest problems.

Scrapped PC podule raises a storm

PLANS for any further development of the PC-compatible 80186 card podule for the Archimedes have been cancelled by Acorn.

The announcement has prompted a flood of complaints from disappointed owners who bought the machine under the impression that a PC adapter was on the way.

The podule would have allowed the Archimedes to run all PC software much faster than with the optional MSdos software emulator.

Acorn's spokesman Michael Page said: "We decided to drop the card because of the lack of demand from the marketplace. Our research shows that the MSdos emulator, which turned out far better than expected, is proving very popular with our customers".

But according to David Bell, Acorn's product manager, it was the expected demand by the end of 1988 that prompted the decision.

He told *The Micro User:* "The computing world is a fast changing market. It was felt that the kind of facilities people require now will have changed by the time the product was ready for release.

"Another aspect to take into consideration was the eventual product price. The podule was expected to retail for about £300 which we felt was a little high and would not attract much interest".

Even though plans for the 80186 podule have been scrapped, David Bell has not ruled out the possibility of a higher-level alternative with 286 or 386 capabilities.

But promises of possible future developments are not good enough for all people.

"I have waited patiently to see what Acorn's position would be about MSdos. If they do not provide complete PC compatibility on the Archimedes they can kiss goodbye to my support", said businessman Colin O'Leary.

New business suite

ARCHIMEDES software specialist Minerva Systems has more new products for the machine. The firm has used its own System Delta programming facility to write a fully-integrated business accounting suite.

Minerva says the suite "shows unrivalled flexibility" while the modules are simple enough for a non-accountant to understand.

System Delta allows the data within the accountancy suite to be read by the database, providing more flexibility and power.

A school administrator package has also been released to cater for pupil, staff and examinations data and to include examination entry reports. Further administration software under development by Minerva includes a timetabling package and student profiling.

Minerva has also been demonstrating pre-production versions of System Sigma which it claims is the world's first spreadsheet management system. It is larger than Lotus 1-2-3.

Major deal

LEADING Acorn dealer Qudos has won a contract to supply up to 5,000 Archimedes 300 series machines to Cambridge University.

Quodos has already started installing them as replacements for the existing 5,000-strong university user base of BBC Micros.

By the end of 1989 Qudos expects to have 1,000 Archimedes machines installed at Cambridge University.

Headed by former Acorn executive Peter O'Keefe, Qudos is now Cambridge University's recommended dealer for Acorn products.

We stay with Acorn, says Watford

A MAJOR player in the Acorn market has reaffirmed his long-term commitment to the Acorn range of machines.

Nazir Jessa, boss of Watford Electronics, made his announcement at his company's 15th anniversary dinner in London recently.

"I have been approached to switch allegiance to the likes of Amstrad and Atari", he told the leading figures in the industry who attended the celebration dinner in London's famous Connaught Rooms.

"But we feel far more confident in our partner of so many years standing rather than these relative newcomers on the scene.

"And the arrival of the Archimedes has only served to convince us we are right".

Senior executives from Acorn joined forces with key industry figures and journalists at the dinner to pay their respects to the personality whose name is synonymous with the BBC Micro.

Both Acorn and *The Micro User* chose the occasion to make presentations to Najir Jessa to mark his company's contribution over the years.

Even the after dinner guest speakers provided a virtual Who's Who of the Acorn scene.

The line up included Terry Sherwood, Acorn's general sales manager, Derek Meakin, managing director of Database Publications, Graham Bell, technical editor of Acorn User, and Peter Welham, managing director of Argus Specialist Press.

Even the doyen of computer journalists, Jane Bird of The Sunday Times, sent a message to Nazir Jessa apologising for not being able to attend the celebration.

"I remember Nazir Jessa and Watford Electronics with affection", she wrote.

Show was a real money-spinner

THE faithful once more turned out in their thousands when the latest in the series of Electron & BBC Micro User Shows was held in London.

Among the crowds who flocked to the event were The Micro User's news editor Mike Cowley and special correspondent Christina Erskine, formerly editor of Popular Computing Weekly.

Here is what they found . . .

AN in-depth survey of visitors attending the most recent in the series of Electron and BBC Micro User Shows has revealed it was a smash hit with the public.

Of those interviewed 98 per cent indicated that their attendance had been well worthwhile.

The main reason for the mass endorsement stemmed from the vast number of special offers on display, with a conservative estimate of discounts available being in excess of £150,000.

And this translated into bonanza sales for exhibitors, for the survey also revealed that almost 25 per cent of those attended spent more than £100.

The show – the 17th in the series – saw the Archimedes come into its own. Almost 10 per cent of show visitors already own the machine, while a further 30 per cent said they intended to do so in the not too distant future.

Not that this means diminished loyalty to the BBC Micro.

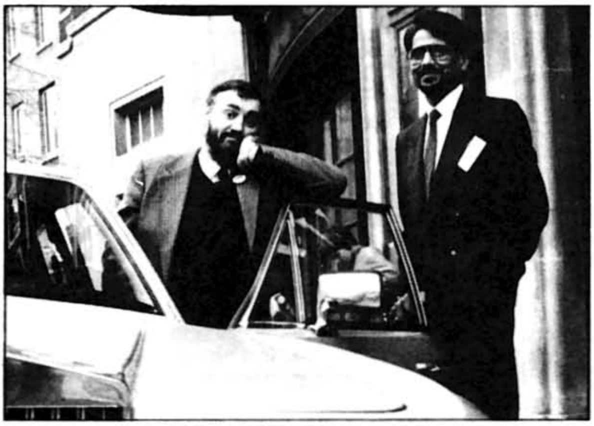
Some 55 per cent said they had owned the machine for more than three years – and intended to carry on doing so even if they bought an Archimedes.

Education wasn't forgotten

THE original market for the BBC – its use in schools and colleges – hasn't faded with time. GCSE courses in Maths, English and French, A-level Maths, programs for primary school learners, beginning Spanish, astronomy... all were available for view.

The GCSE courses came courtesy of LCL, part of its Home College series. Rickett Educational Media had plenty to show off in the primary school department, including some of the early learning material from Mirrorsoft.

Espana Viva comes from the BBC itself, and links closely with the TV series, while astronomy was catered for by High Level Algorithms – a computer generated tour of the Solar System from the asteroid belt down to earth.



An unhappy Kenneth Hardacre finally catches up with Nazir Jessa of Watford – but too late for a ride in the Rolls.

APACE INTO SPACE

ONE product launched at the show was not a computer or piece of software at all, but Pace Micro Technology's satellite TV receiver, displayed (prominently) to test the public's reaction. The receiver is fully infra-red remote controlled, with 39 selectable programme memories with battery back-up.

A Pace spokesperson said that the company hoped to start selling the SR640 receiver, designed and manufactured in the UK, within the next three months. Not that Pace has deserted modems and micro communications equipment. It also chose the show to launch its newest modem, the Linnet 1200.

This is a V21/23 intelligent modem, with auto-dial, auto-answer facilities, split baud rate (for 1200/1200 modem communication) and three Help pages to clarify operations.

The company also demonstrated its Series 4 and Nightingale modems, Commstar II software plus the add-on 5.25in disc drives for the BBC range.

Unlucky for some

AN unemployed Yorkshireman turned out to be the world's unluckiest competition winner when he visited the show on – Friday the 13th.

For the prize Kenneth Hardacre had come to collect – a solderless sideways rom socket board worth £350 – works only with a BBC Micro.

The problem? Kenneth had just been forced to part with his BBC Micro.

"When I entered the Watford Electronics' competition, I still had my Beeb," moaned Kenneth. "I can't believe how unlucky I've been".

But the chapter of misfortune didn't end there.

For a second part of the prize was that the winner was to be transported across London in the Rolls Royce owned by Nazir Jessa, the Watford boss.

Unfortunately the train from Yorkshire was two hours late and the Acorn-green Roller couldn't wait.

The end result was that the winner also missed the slap up lunch he'd been promised.

"I'm staying indoors next Friday the 13th", said Kenneth.

New Years Resolution

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A BRAND NEW SUPPORT GROUP HAS BEEN LAUNCHED FOR THE ACORN ARCHIMEDES COMPUTER

RISC USER is written by an experienced team of Archimedes enthusiasts with roots in education, home computing, and over 5 years experience with the BBC Model B and Master computers with BEEBUG magazine. So popular is BEEBUG that membership exceeds 20,000 worldwide.

RISC USER provides lively and informed coverage of what's happening in the world of the Archimedes. Reviews, hints, programs and articles are specifically written for the Archimedes, showing how to exploit the many features of this sophisticated computer. RISC USER has material of direct use to education, business, industry and home computing.

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AU 1

MORE FROM THE SHOW

Sounds exciting

THE sound capabilities of the BBC Micros ensure that no BBC show will ever be quiet. Proving the point, Fsoft, Hybrid Technology and Peartree Computers were all out in force to demonstrate their wares.

Fsoft's Music Maker provides an inexpensive introduction to composing your own tunes on the BBC range and uses colourful screens to develop your manipulations of notes within The Sound module. The second part of the program, The Player, then enables you to play the notes created.

Hybrid's Music System is for the more experienced, providing an additional 16-channel keyboard and four octave synthesiser, and Ample software, enabling you to compose your riffs, and mix them, before or during playback. Midi-equipped instruments can also be added to the system with the optional Music 2000 interface.

Peartree's Music 87 synthesiser also provides editing, mixing and manipulation facilities for the more dedicated composer and is compatible with mice and lightpens to access its options.

Electromusic Research also had its wide range on display, including its Miditrack Music System, demonstrated with a full range of Midi instruments.

ARCHIMEDES PRODUCTS

DESPITE the price, and despite the commonly-held but highly-inaccurate notion that no-one as yet own an Archimedes, products shown for Acorn's Risc-based machines had the crowds flocking.

Computer Concepts, with a number of BBC programs under its belt, is particularly firm in its support for the Archimedes.

"We would like to see the machine take off in a big way, and we'll be there when it does," proclaimed CC chief programmer James Lynn.

Minerva Systems was one of the first companies to stand up and have its software counted when the Archimedes was launched. In addition to its initial Archimedes database range, it showed graph, spreadsheet and accounting packages at the show.

The most popular Archimedes attraction of all, however was undoubtedly the Zarch arcade, where Superior Software's beautifully smooth, impressive game was available for visitors to try out – and much difficulty keeping the hoverplane the right way up was had by all.

Latest in software

ANYONE who could tear themselves away from Zarch found that there was plenty in the shooting, blasting, strategy and simulation departments.

Superior Software showed the latest in the Repton Saga, the Life of Repton. Here the hero, inexplicably named after a boys' public school, is taken through an ad hoc seven stages of man – you must negotiate him safely through to a happy old age.

Tynesoft showed two more in its Microvalue compilation series: Number 2 gives you Mousetrap, Megaforce, The Great Wall and Gunsmoke – none of which would tempt you away from Zarch, but a lot cheaper at £3.99. Microvalue Gold comprises the famous Jet Set Willy coupled with Ian Botham's Test Match, also at £3.99.

If Tynesoft is a stalwart, what would one call CDS? Yes, Steve Davis Snooker is still on the go, along with Colossus Chess and the newer Brian Clough's Football Fortunes. CDS also took the oppurtunity to show its new Blue Ribbon budget titles, six titles in all.

THE GALLUP CHART TOP 20 BBC SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	TAPE PRICE
1	△ 5	**PLAY IT AGAIN SAM** *Superior*	9.95
2	▽ 1	**PALACE OF MAGIC** *Superior*	9.95
3	◁ 3	**GRAND PRIX CONSTRUCTION SET** *Superior*	9.95
4	▽ 2	**SURVIVORS** *Atlantis*	2.99
5	●	**LIFE OF REPTON** *Superior*	6.95
6	▽ 4	**CRAZEE RIDER** *Superior*	9.95
7	◁ 7	**SPITFIRE 40** *Mirrorsoft*	9.95
8	▽ 6	**SPY VS SPY** *Tynesoft*	9.95
9	△ 11	**PAPERBOY** *Elite*	9.95
10	●	**LEAGUE CHALLENGE** *Atlantis*	2.99
11	●	**JETPAK** *Mastertronic*	1.99
12	△ 20	**AROUND THE WORLD IN 40 SCREENS** *Superior*	6.95
13	●	**RANSACK** *Audiogenic*	9.95
14	●	**ARKANOID** *Imagine*	8.95
15	●	**ZIGGY** *Audiogenic*	7.95
16	●	**ELITE** *Superior*	12.95
17	▽ 15	**DUNJUNZ** *Bugbyte*	2.99
18	●	**TRIPLE DECKER 2** *Alternative*	1.99
19	▽ 13	**LIVING DAYLIGHTS** *Domark*	9.95
20	●	**CODENAME DROID** *Superior*	9.95

Compiled by Gallup/Microscope

Palace of Magic leaves the number one spot this month to make room for Superior's compilation, Play It Again Sam. There are seven new entries and two re-entries this month and, despite an increase in budget software, the full-priced games are holding their own.

Build your own system...

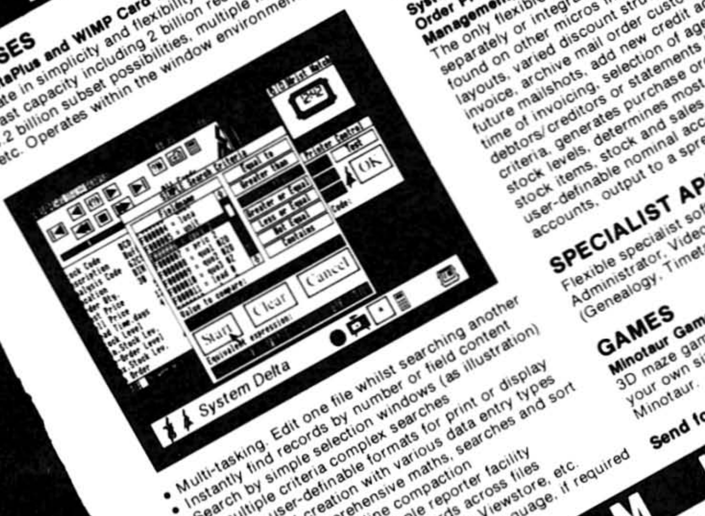
with the Minerva SYSTEMS DELTA, GAMMA and SIGMA

Individual programs designed to integrate; use separately or link together to form a powerful business system. Systems Delta, Gamma and Sigma . . . designed by highly acclaimed professional programmers with proven ability on the BBC, now providing definitive software for the Archimedes.

ARCHIMEDES

DATABASES

System DeltaPlus and WIMP Card Index £69.95 The ultimate in simplicity and flexibility. Unrivalled in power. Vast capacity including 2 billion records, 16 million fields. 4.2 billion subset possibilities, multiple files open at once, etc. Operates within the window environment.



- Multi-tasking. Edit one file whilst searching another
- Instantly find records by number or field content
- Search by simple selection windows (as illustration) or multiple criteria complex searches
- Multiple user-definable formats for print or display
- Simple card creation with various data entry types
- Unrivalled, comprehensive maths, searches and sort
- Mailing labels with line compaction
- Comprehensive, yet simple reporter facility
- Card copier to transfer records across files
- Imports data from dBase, Lotus, Viewstore, etc.
- Includes relational programming language, if required

DeltaBase £29.95 *Affordable excellence*
Extremely powerful yet simple to use general database. Over 8000 records, 255 fields and 16 subsets. Pull down help screens. Various screen modes. Extensive single or multiple criteria searches, sorts and maths facilities. Restructuring records is easy. Imports data from Viewstore, Betabase, InterBase, Mini-Office, etc.

ACCOUNTS

System Delta Business Accounts £69.95 each module Order Processing/Invoicing, Sales Ledger, Stock Management, Purchase Ledger, Nominal Ledger
The only flexible accounting suite. Use modules separately or integrate. Contains many features not found on other micros including definable invoice layouts, varied discount structures on one invoice, archive mail order customers for future mailshots, add new credit account at time of invoicing, selection of aged debtors/creditors or statements by various criteria, generates purchase orders, suggests stock levels, determines most profitable stock items, stock and sales graphs, numerous user-definable nominal accounts with unlimited bank accounts, output to a spreadsheet.

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Flexible specialist software available for School Administrator, Video Rental, Newsagent, Hotelier (Genealogy, Timetabling coming early 1988)

GAMES

Minotaur Game £14.95 3D maze game. Fast reactions not needed. Create maze to your own size. Survive to rescue the men and kill the Minotaur.

Send for full brochure including other products

BBC MICRO

System Delta with Card Index £64.95
Still the most comprehensive and flexible data management system on the BBC. 8160 records, 255 fields, 8000 characters per record. 8 subjects. Up to 5 files open at any time. Find any record in 3 seconds. Extensive single or multiple criteria searches, sorts and maths facilities. Multiple print formats. Default card. Card copier for transfer between files. Fully programmable relational system with over 150 commands available.

Mailshot, Reporter and Inter/View Link £19.95 each
Three versatile support programs for use with all System Delta files. Mailshot produces up to 4 across labels and links with wordprocessors for mail-merged documents. Reporter produces simple lists as well as fully definable reports including negative or positive columns, averages, totals, headings, sub and sub-sub-totals. Inter/View Link transfers data directly or as a result of any calculation including sum, average, count, etc.

System Delta Personal Accountant £45.95 (Nominal £55.95) each module
Five comprehensive accounting modules for use separately or as integrated suite. Many advanced features as listed above. Total flexibility allows customisation if required.
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School Administrator £69.95
Pupil and staff records allow extra fields to be added if desired. Entry reports for examination boards. Form 7 DES statistics, etc.

MINERVA SYSTEMS
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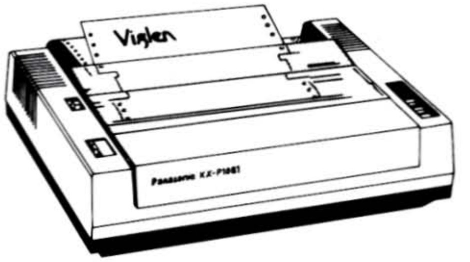
SPECIAL OFFERS FROM VIGLEN

PANASONIC PRINTER KIT



The Panasonic KX-P1081 come complete with £45.00 worth of accessories FREE including tractor feed and roll feed units with paper, printer cable, and a specially designed metal printer stand. Features include:

- ★ 120 cps draft printing 24 cps NLQ
- ★ IBM and Epson compatibility through dip switch settings
- ★ Prints 80 coloumns on A4 cut sheets, continuous stationery or roll paper 9 × 9 draft and 18 × 23 NLQ

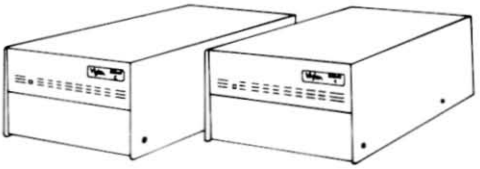
Stock Code	Description	Price inc. VAT
SP079	Panasonic KX-P1081 plus accessories	£185.95

Please add £8 for insured courier delivery.

WINCHESTER

MEGA BYTES FOR MINI BUCKS

NEW LOW PRICES



Plug in 20 to 112 Megabytes of extra storage with the Viglen Winchester system.

The Viglen Winchester is ready to plug in and use on a BBC Master micro; for a BBC B or B plus you will merely need to fit the Acorn ADFS Rom. The Winchesters are 100% compatible with the Acorn Winchester and Acorn ADFS and will also work with the Acorn Master 512 board with DOS plus.

Drive 1 Winchesters are also available for backup or just more storage and simply plug into the back of the Drive 0 unit.

The Winchester package consists of: Winchester unit (cased with controller boards, power supply and fan), Master reference Manual part 1, Winchester user guide and Winchester utilities on disk (such as formatter, verifier, ADFS menu and sophisticated backup program allowing you to make fast backups on DFS disks, ADFS disks or Drive 1 Winchester).

Stock Code	Description	Price inc. VAT
Drive 0 Single		
SP0150	VB20 20Meg Viglen Winchester	£499.00
SP0152	VB28 28Meg Viglen Winchester	£519.00
V155	VB40 40Meg Viglen Winchester	£799.00
V156	VB56 56Meg Viglen Winchester	£899.00
Drive 1 Second Drive		
SP0160	VB120 20Meg Drive 1 Winchester	£479.00
SP0162	VB128 28Meg Drive 1 Winchester	£499.00
V165	VB140 40Meg Drive 1 Winchester	£739.00
V167	VB156 56Meg Drive 1 Winchester	£769.00
V157	20MB Tape Streamer Backup	£689.00
V503	Acorn ADFS Rom and Manual (Only necessary for BBC B or B Plus)	£29.95

Please add £8 for insured courier delivery.

Available for use with SJ research file server at no extra cost, please specify when ordering.

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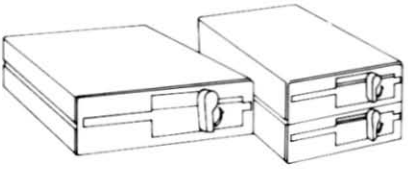
FROM £99.95 inc. VAT

The finest Japanese disk drives (not Taiwanese immitations) available at the lowest prices.



All disc drives are supplied with a manual, packed utilities disc and a full 12 Months warranty (2 Year Warranty available) and are ready to plug in and use on a BBc B (fitted with a DFS) B + or Master micro. 40/48 Track drives have a switch which enables operation in either 40 or 80 track mode.

The capacity quoted are given in single density mode; for double density mode (1770 DFS + ADFS as in the Master) the capacities should be approximately doubled.

An integral power supply is not necessary as the disc drives run from the micro's power source however should you require drives with their own power supply, these are also available.

If your BBC B micro does not have a DFS fitted then you will also require the Acorn dfs kit. These are available from Viglen.

Stock Code	Description	Price inc. VAT
SP014	400K Single Drive 40/80T	£99.95
SP030	400K Single Drive 40/80T + PSU	£109.95
SP019	800K Dual Drive 40/80T	£189.95
SP020	800K Dual Drive 40/80T + PSU	£209.95
VPD0240	100K Single Drive	£105.95
VPD0241	400K Single Drive 40/80T	£113.00
VPD0242	200K Dual Drive	£195.95
VPD0243	800K Dual Drive 40/80T	£219.00
VPD0245	100K Single Drive + PSU	£119.95
VPD0246	400K Single Drive + PSU	£135.00
VPD0247	200K Dual Drive + PSU	£209.95
VPD0248	800K Dual Drive 40/80T + PSU	£235.00
VPD0249	800K Dual Drive 40/80T + PSU in Metal Bridge Unit	£265.00
V0060	3.5" 400K Single Drive	£95.95
V0061	3.5" 800K Dual Drive	£199.95
V0062	3.5" 400K Single Drive + PSU	£135.00
V0063	3.5" 800K Dual Drive + PSU	£199.00
V0064	3.5" and 5.25" 800K Dual Drive	£219.00
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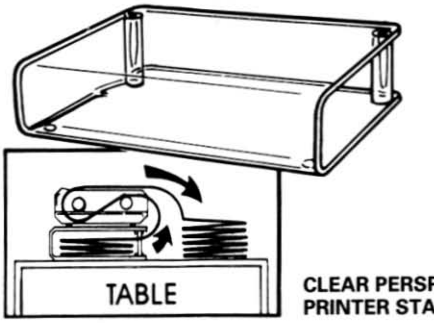


CLEAR PERSPEX PRINTER STAND

The Viglen printer stands are beautifully finished in clear perspex and raise the printer high enough to put continuous stationary underneath.

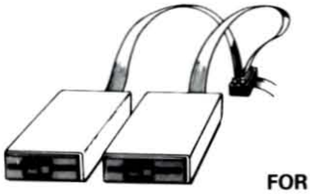
Stock Code	Description	Price inc. VAT
V490	80 Column Printer Stand (15" × 13" × 3.5")	£19.95
V491	136 Column Printer Stand (23.5" × 13" × 3.5")	£29.95

Please add £3 P & P

ORDER FORM ON LAST PAGE OF VIGLEN SECTION

SPECIAL OFFERS FROM VIGLEN

DUCKS



DUAL DRIVES FOR LESS THAN £17!

The Viglen Data DUCK (Dualling Up Connector Kit) converts any two single drives to a dual drive instantly. Simply plug the duck into the micro's disk drive socket and plug two single drives (any type and any make) into the duck to obtain a dual drive system accessed as drive 0 (and 2 if double sided) and drive 1 (and 3 if double sided). If neither single drive has its own power supply then you will require a Viglen power DUCK in order to obtain two disk drive power sockets from the micro.

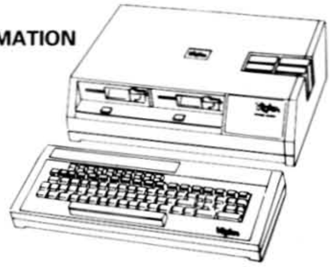
- ★ No soldering simply plugs in.
- ★ No need to take disk drives apart to change links.

Stock Code	Description	Price inc. VAT
V084	Viglen data duck	£16.95
V085	Viglen power duck	£7.95

Please add £2.50 for P & P.

CONSOLE SYSTEM

MASTER TRANSFORMATION



Give your BBC Master micro the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour matched to the BBC Master and it gives your Master a very neat and impressive look.

- ★ Will support monitors including up to 16" TV.
- ★ Can house two 5¼" disk or Winchester drives.
- ★ Capable of housing 3½" drives.
- ★ Will accept Acorn cartridges and the Viglen Master Cartridge system.
- ★ Full internal metal screening.
- ★ Also available with fitted drives (5¼", 3½" or Winchester) or as a complete system including the Master.

The Master console unit system packages includes:

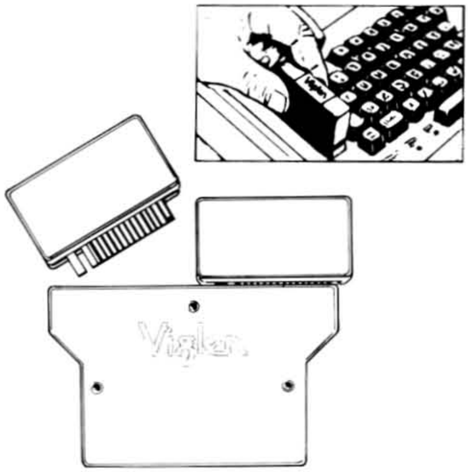
- ★ Remote Keyboard case with cable.
- ★ Metal screened main unit casing (including internal fittings for 5¼" drives).
- ★ Two switches which can be used for 40/80 track switching and can be either fitted on the front or rear of unit.
- ★ Two blanking plates to blank out any drive aperture that is not used.
- ★ Full labelling kit.
- ★ Fully illustrated fitting instructions.

Stock Code	Description	Price inc. VAT
V861	Viglen Master Console unit	£59.95
Accessories for the Master Console unit		
V853	Dual Drive data cable for console unit	£9.95
V854	Dual Drive power cable for console unit	£7.95
V855	Power supply for the console unit	£34.95
V866	Fan Kit for console unit	£34.95
V858	Fitting bracket for 3½" drive	£8.95
V851	Viglen Professional Console Unit for the BBC micro	£49.95
	Fitting service available from	£15.00

Please add £8 for insured courier delivery.

CARTRIDGE SYSTEM

VIGLEN ROM CARTRIDGE SYSTEM



Having fitted the Viglen Rom cartridge system to your BBC, Master or Master COMPACT, you can plug in your Roms/Eproms simply by inserting each one in a Viglen cartridge and plugging in whichever cartridge you want to use. The same Viglen cartridge can be used on all the micros mentioned and there is no need to switch the micro on and off between cartridge changes.

The Viglen cartridge system for the BBC micro consists of the cartridge cable assembly and socket, blanking off plates, 1 cartridge and cartridge storage rack. The cartridge socket when fitted protrudes from the rectangular slot on the left of the keyboard where the cartridges are subsequently inserted. It is simple to fit and requires no soldering.

The Viglen cartridge system for the Master and Master COMPACT simply plugs into your Master cartridge slot (or COMPACT expansion port) and accepts two Viglen cartridges. On the Master you can plug in up to two Viglen cartridge systems thus giving you access to 4 Viglen Cartridges simultaneously. The system comes complete with 2 cartridges and cartridge storage rack. On the Master you can also use Viglen cartridges which have 32 and 64K paged Roms inserted.

Stock Code	Description	Price inc. VAT
V560	Viglen Rom cartridge system for BBC	£12.95
V559	Viglen Rom cartridge system for BBC (low profile)	£12.95
V550	Viglen Rom cartridge system for Master	£14.95
V551	Viglen Rom cartridge system for COMPACT	£14.95
V561	Single Viglen cartridge	£3.45

Please add £2.50 P & P (£00.50 for single cartridge).

We cannot possibly fit all the products in our range in this advertisement. For further details about our products please call the Sales Hotline – 01 843 9903

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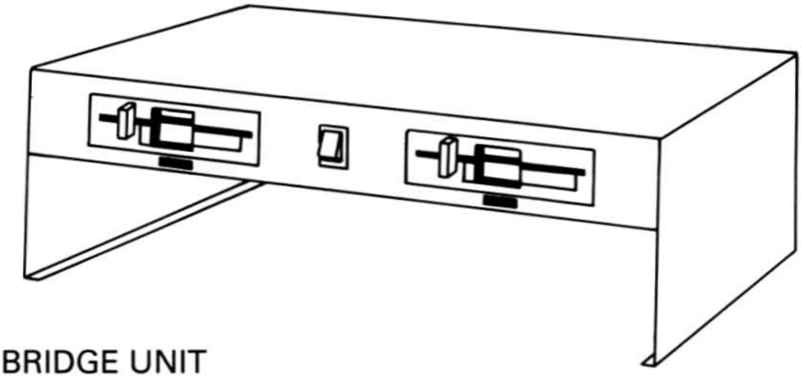
- ★ FRONT PANEL SWITCHING
- ★ 800K DUAL DRIVES 40/80T WITH PSU

Direct disk drives are manufactured to the highest standard using high quality Japanese mechanisms. All drives are supplied complete with user manual and utility diskette.

Stock Code	Description	R.R.P.
SP0249	800K Drive in Bridge Unit with PSU	£229.95

SPECIAL OFFER £229.95 Inc. VAT



DIRECT MASTER BRIDGE UNIT

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Unit 7
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Hanwell, London W7 2QA
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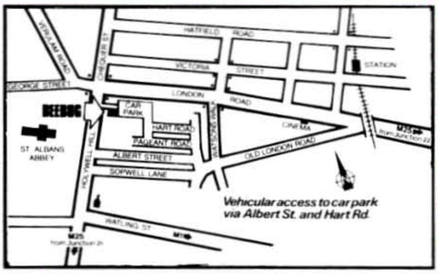

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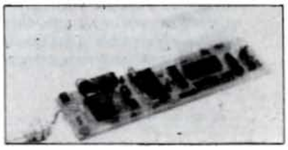

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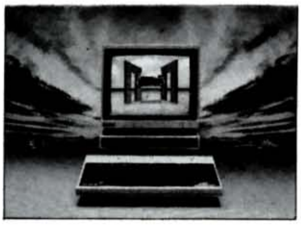

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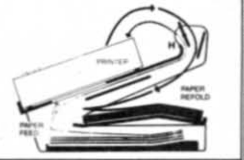

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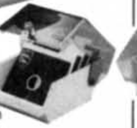

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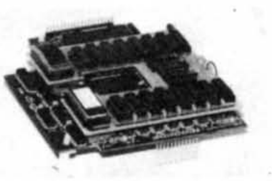
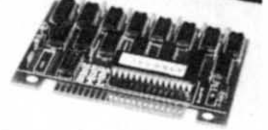




THE PC-500:

The PC-500 is just what you need to take advantage of the biggest software investment on earth: PC software, PC public domain and PC shareware.

The PC-500 is the Acorn 80186 internal co-processor for the MASTER adapted by Solidisk with an appropriate lead for use on the BEEB (and the Master).

It has a mouse, 512K of RAM, 10MHz — 16 bit CPU (around 3 times the speed of the normal PC), 4 software discs containing the Digital GEM operating system, a wordprocessor, a painting program, CPM emulator and other utilities.

Price: **£239 inclusive.** Your BEEB must have a WD-1770 and ADFS.

Data sheet available on request.

THE PC-PLUS:

The PC-PLUS is an expanded PC-500, with one Megabyte of RAM instead of 512K. The extra memory allows large applications such as Desk Top Publishing (eg Fleet Street Editor) to be used on the BEEB or the MASTER.

The PC-PLUS is supplied with the same accessories as the PC-500 including the mouse and 4 discs. Price **£339 inc.**

Upgrade from an existing Acorn 80186 costs **£119.00** but you will be required to sign a service agreement. Please ring for details.

Data sheet available on request.

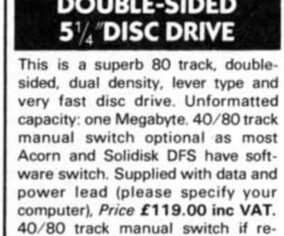
MASTER MEGA CARD:

The MEGA CARD (256K) plugs into a cartridge slot on the MASTER and adds instantly 256K of RAM. The card can be used as RAMDISK, printer buffer or sideways RAM. Price **£100.00 inc.**

Data sheet available on request.

It's Easy To Masterise Your Beeb

With Solidisk Add-Ons!

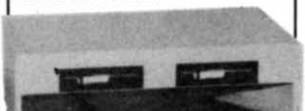


DOUBLE-SIDED 5¼"DISC DRIVE

This is a superb 80 track, double-sided, dual density, lever type and very fast disc drive. Unformatted capacity: one Megabyte. 40/80 track manual switch optional as most Acorn and Solidisk DFS have software switch. Supplied with data and power lead (please specify your computer), *Price* **£119.00 inc VAT.** 40/80 track manual switch if required: **£2.00 inc VAT.** Separate PSU if required: **£25.00 inc VAT.**

TWIN DOUBLE-SIDED 5¼" DISC DRIVES

Complete with bridge unit, suitable for both BBC and Master 128K, *Price* **£238.00 inc VAT.**



WD-1770 DFS:

The new Acorn Disc Filing Systems DFS and ADFS require both the WD-1770 chip. Solidisk offers two basic WD-1770 models which are totally compatible with the Acorn DFS/ADFS ROMs. We also offer our own DFS 2.2 and ADFS 2.1 ROMs which have a superset of utilities and commands. Data sheets on these ROMs are available on request.

1) WD-1770 DUAL DENSITY DISC INTERFACE for previously tape based BEEB. This is the standard Acorn disc upgrade since 1985. Prices are:

WD-1770 DDFS without DFS ROM	**£35.00 inc.**
WD-1770 DDFS with DFS 2.2 ROM	**£45.00 inc.**
WD-1770 DDFS with ADFS 2.1 ROM set	**£55.00 inc.**

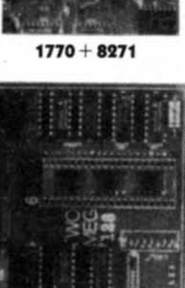
Data sheet available on request.

2) WD-1770+8271 (DFDC) DISC INTERFACE: for BEEB already equipped with the 8271. This system allows you to keep the existing 8271 disc interface while adding the new WD-1770 chip. It has a simple switch to allow changing between the 8271 and the WD-1770. To operate the hardware, you will need either the latest ROMs from Acorn (8271 DNFS 1.2, 1770 DNFS and 1770 ADFS) or Soidisk ROMs. If you are stuck with old or inappropriate DFS software, buy the inexpensive DFS 2.2 ROM. Prices are:

DFDC without DFS ROM	**£45.00 inc.**
DFDC with DFS 2.2 ROM	**£50.00 inc.**
DFDC with ADFS 2.1 ROM set	**£55.00 inc.**
DFDC with 2.2 and 2.1 set (3 ROMs)	**£63.00 inc.**

Data sheet available on request.

WD-1770 DFS



1770 + 8271

TWOMEG 128K: Number One Best Seller!

The new style TWOMEG 128K add-on board for the BBC is the closest emulation of the Master 128K ever achieved. It combines Sideways RAM, Shadow RAM and four extra Eprom sockets (4 on the BBC motherboard) in a single product. It is unobtrusive and easy to fit, just drop in and go!

It's the ideal upgrade for all Beebs, with more ROM sockets and even bigger memory than the Master! Compatible with Computer Concepts InterWord, Sheet and Spellmaster, Acorn View 3.1, ViewSheet, ViewStore and Basic, it is supplied with a quantity of useful software on five discs, eg database, spelling checker, macro basic, Ramdisk for STL DFS and ADFS etc.

A clever switch write-protects only the 8 banks of Sideways RAM, without affecting the Shadow RAM. *Price: ex VAT:* **£52.17, inc VAT £60.00**

FOURMEG 256K:

256K RAM (shadow and/or Sideways) 4 extra H/C ROM sockets on board (4 on BBC motherboard), 4MHz switchable CMOS 65CO2 cpu, 32K Manager ROM. *Price* **£110.00 inc VAT.**

TWOMEG 256K:

256K RAM (shadow and/or Sideways) 4 extra H/C ROM sockets on board (4 on BBC motherboard), 2MHz CMOS 65CO2 cpu, 32K Manager ROM.

Special Offer on InterWord and Wordwise Plus when purchased with any TWOMEG or FOURMEG board:

Wordwise Plus:	**£30.00 inc VAT**
InterWord:	**£50.00 inc VAT**

Wordwise
BASE

TWO MEG 128

Only £60 inc VAT!

REAL TIME CLOCK:

gives your Beeb time, date and configure facilities similar to the Master. *Price* **£29.00 inc VAT.**

SWR32: 32K Sideways RAM, base unit and disc. *Price* **£20.00 inc VAT.** SWR 64: 64K Sideways RAM, 2 H/C ROM sockets on board, base unit and disc. *Price* **£30.00 inc VAT.**

EPROM PROGRAMMER:

The UVIPROM is the cheapest Eprom programmer on the market, yet the easiest to use. UVIPROM for programming 2764 and 27128 (21V): **£20** UVIPROM-32 for programming 27256 (12.5V): **£20 inc VAT.** MULTIPROM, the deluxe version, programs most types of Eproms and fitted with TEXTOOL ZIP socket, *Price* **£44.50 inc VAT.** The UVIPAC (Eprom Eraser) can erase any 3 Eproms in approximately 15 minutes, *Price* **£20.00 inc VAT.**

MASTERPLAN:

If you are thinking of exchanging your BEEB for a MASTER or an ARCHIMEDES, Solidisk MASTERPLAN is for you. We can quote immediately over the phone the buy-back value of your BEEB and the balance on your new system. So please give us a try!

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVENUE, SOUTHEND

ARCHIMEDES Computers

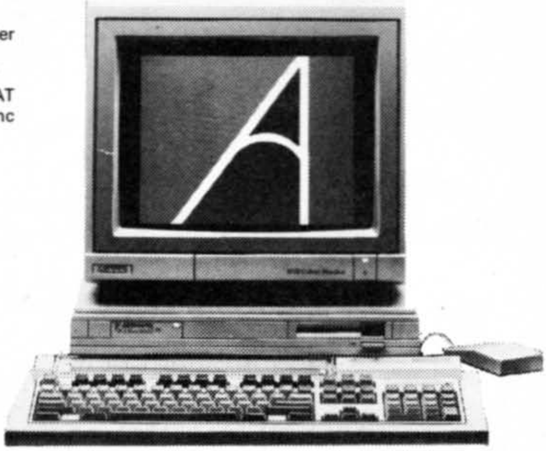
A305 PLUS, 1 Megabyte of RAM: £731 + VAT

v A305 upgraded to 1 MB, same as 310
v with Acorn colour monitor: £913.50 + VAT
v with Philips colour monitor: £930 + VAT

A440: FREE NLQ PRINTER, £2,299 + VAT

v 4 MB OF RAM, 20MB Winnie, built-in floppy drive,
v build-in packplane,
v free EPSON FX80 compatible NLQ printer (Panasonic KX-P1081).
v with Acorn colour monitor: £2,481 + VAT
v with Philips CM8833 monitor: £2,498 + VAT
v super discount available on Multisync monitors, please call

BEST DEALS



Please note:
Many packages such as Acorn Arc-Writer or Logistix leave little room on the program disc so that a second drive is very useful. Unless you plan to get the 20MB Winchester, our external drives (eg FD35A) are good and low cost.
If you are going to use the MS-DOS Emulator, we recommend our FD525A, 40/80 track switchable because most PC software is still supplied on 5¼" format. For 100% media compatibility, you will need a 40-track double sided 5¼" drive, such as our PC525 (see below).
The way the new Arc software is going, everyone will sooner or later send to upgrade the memory to 4 Megabytes (and even beyond). If you can't afford an A440 now, you can trade-up from your 305 Plus. We will normally allow you 85%-95% of our invoice value.

ACORN ADD-ONS:

	normal
20 MB Hard Disc (AKD52)	£499.00
2-slot Podule Backplane (AKA01)	£39.00
ROM Podule (AKA05)	£39.00
I/O Podule (AKA10)	£79.00
MIDI add/on to I/O Podule (AKA15)	£29.00

Please add VAT to the above prices.

---

registered customers

6% DISCOUNT

SOLIDISK ADD-ONS:

3.5" second drive (FD35A, external)	£100.00
5¼" second drive (FD525A, external)	£110.00
ARC-SAVER (released soon): (4-slot podule backplane with Thermi-fan)	£49.00
Dual user port podule short:	£13.00
Dual user port podule long:	£16.00
Eprom Programmer to be used with our Dual for 27C128:	£18.00
Multi-Prommer for all types:	£39.13
Eprom Eraser:	£17.39
Teletext and TV adapter:	£87.00
Image-Master (video digitiser):	£52.17
Advanced Image-Master:	£156.50

Please add VAT to the above prices.

COMPACT 128K:

	Without monitor		Acorn monochrome		Acorn colour	
	ex VAT	inc VAT	ex VAT	inc VAT	ex VAT	inc VAT
Compact 128K:	347.80	399.97	391.30	449.99	521.00	599.15
Compact 128K, CDFS ROM and a second disc drive, A, B or C:	434.00	499.10	478.00	549.70	608.70	699.99

A = twin 3.5" drives, B = 5.25" drives, C = one 3.5" and one 5.25".
Twin drives are usually required for disc copying, the Solidisk CDFS complements the Acorn ADFS with a superset of DFS commands and utilities such as single and double density, copying DFS discs to ADFS discs etc.

MASTER 128K:

	Without monitor		Philips monochrome		Philips colour	
	ex VAT	inc VAT	ex VAT	inc VAT	ex VAT	inc VAT
Master 128K:	391.00	449.65	455.00	525.25	574.00	660.00
Master 128K with Twin disc drives:	556.50	639.97	635.00	730.25	730.43	839.99

The MASTER 128K comes bundled with Wordprocessor (View), spreadsheet (ViewSheet), Terminal software, DFS and ADFS. The monochrome monitor is 12", can be with green (BM7022) or amber (BM 7522) phosphor, the colour monitor is 14" CM8833 with all imaginable inputs! (The Acorn colour monitor is a badged version of the latter.)
PLEASE NOTE: generous TRADE-IN allowances are available for upgrading your present system. Please call for immediate quotation.

TELETEXT AND TV ADAPTER

This unit includes a programmable TV tuner, a teletext adapter and a mains power supply unit. It has one input for the aerial and two output sockets. One socket is for connection to the computer and the other for composite video and sound, for connection to a suitable monitor such as the Philips CM8833. It is supplied with software on disc for any of the following computers: BBC model B, Master, Compact, Arc, ST and Amstrad PC. Unlike the ATS ROM (Morley version) with which it is fully compatible, it can download software for any other computer than the BBC. It can be used as a conventional TV tuner, except that channel selection is done by software and the details saved to disc (so that you can watch football at work!). Price: £99 inc. VAT (please specify computer and disc format).

IMAGE-MASTER:

This cost-effective video digitiser converts directly composite TV signal (camera, VTR, teletext adapter etc) to computer display. Image-Master resolution: 640 × 256 by 16 colours or shades but the computer display resolution is limited by your computer. Available for Arc, BBC, Master, Compact, ST and Amstrad PC. Price: from £60 inc. VAT (Please specify your computer, Arc model requires our user port podule). There are one input (composite video in) and two outputs (video out and to computer), 3 knobs (brightness, contrast and aspect ratio). The unit should be used with a suitable monitor such as the Philips CM 8833.

ADVANCED IMAGE-MASTER:

This digitiser can not only convert video signal into computer data, it can be used as a super colour display for the computer and replaces a GENLOCK device for picture over picture. It is capable of 4096 colours, 640×256 pixels and output for recording onto video tape or RGB (analog) monitor. There are two inputs (computer display in and camera) and 3 outputs (VTR out, Analog RGB out and computer data). Available initially (JAN 1988) for Arc and ST. Price £180 inc. VAT. Data sheets are available on request.

****

DTP SYSTEM INC. LASER PRINTER: £2499 + VAT!

****

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All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:
Less than 1 KG (eg software, cartridges and books): **£2.00**
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Up to 10 KGs (eg computer, monitors, printers, twin disc drives): you can specify either parcel post £6.00 or courrier/Datapost: **£12.00.**
Above 10 KGs (eg complete system), please either allow generously or give us a ring for quotation.

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Checksums explained

Get it right!

Steve Turnbull unravels their innermost secrets

SINCE we first published the Checksum program in the June 1987 issue of *The Micro User* people have written in with the problems they've been having using the Basic generator program.

To help this situation we began putting an all-singing all-dancing machine code version on to each monthly disc – unfortunately it's too long for the magazine. But now we're bringing all the information together once and for all.

Panel I shows the steps to produce Checksums using the Basic program, and Panel II shows the facilities available in the long machine code version.

The listing given with this article produces a much shorter machine code program that generates checksums without all the frills and it can stay resident in your micro to be called when you need it. So type in the listing and, using an older Get it Right!, make sure the checksums match – if you're not sure how to do this read Panel III – save the program and then run it. The code created and saved is the new checksum generating program.

You can run this version just by typing:

```
*xs
```

After this you can call it again with:

```
CALL&B00
```

No disc access is needed. To produce a printout of the checksums you'll need a Control+B before pressing the Return after *xs, or if you want the automatic paging facility use Control+N. To switch these off afterwards use Control+C and Control+O respectively.

If you are using the 6502 second or co-processor you should alter the program to run at &F600 by changing line 80 to read:

```
80 wrch=&FFEE:byte=&FFF4:code=&F600
```

It's used in just the same way. To call it after the first run use:

```
CALL&F600
```

I hope this finally clarifies the checksums and how you should use them.

Type in the program in the June 1987 issue of *The Micro User* and save it as *BCheck*. Run it, then isolate and correct any typing errors you may have made.

Find out your normal PAGE setting using:

```
PRINT ~PAGE
```

This gives you a three or four digit hexadecimal number, that we'll represent with XXXX.

Now enter this sequence of instructions:

```
MODE 7
PAGE=&7000
LOAD"BCheck"
*KEY9"PAGE=&7000|MOLD|MRUN|M"
*KEY8"PAGE=&XXXX|MOLD|M"
PAGE=&XXXX
NEW
```

Your computer now has the BCheck program loaded and the function keys correctly set up, so you you can begin to type in the magazine listing, described in Panel III.

To run BCheck and generate the checksums just press f9. When the checksums have been displayed you can return to your program using f8.

Panel I: Using the Basic checksum generator

This program is on all *The Micro User* monthly discs from December 1987 and must be loaded from disc each time it is run using:

```
*xsum
```

This generates checksums from the first to last line, it has automatic paging and can be interrupted by pressing the Escape key. There are several other variations on this command:

```
*xsum P
```

sends the complete list of checksums to the printer. You can specify start and end line numbers as well, in the same format as the LIST command:

```
*xsum 500,1000
*xsum 1540,
*xsum P 220,320
```

The final example will send the checksums of the specified line numbers to the printer.

When you specify the range of line numbers the cumulative checksum digit is still calculated from the complete program and so is still correct.

Panel II: Facilities of the long machine code checksum generator

```
   10 REM   Short Checksums
   20 REM   by Steve Turnbull
   30 REM (c)  The Micro User
   40 MODE7:PROCinit:PROCassemble
   50 OSCLI"SAVE xs "+STR$~code+"+200"
   60 END
   70 DEF PROCinit:newl=&FFE7
   80 wrch=&FFEE:byte=&FFF4:code=&B00
   90 rem=&F4:return=13:spc=32
  100 qts=ASC"""":colon=ASC":"
  110 comma=ASC",":Lbrk=ASC"["
  120 rbrk=ASC"]":mcom=ASC"\"
  130 Lcrc=&70:ocrc=&72:wcrc=&74
  140 Lptr=&76:crcptr=&78:Lnum=&7A
  150 LLen=&7C:Ltmp=&7D:txtptr=&7E
  160 nmbase=&80:Lonum=&81:hinum=&82
  170 Lowrk=&83:hiwrk=&84:qflg=&85
  180 codeflg=&86:savebyt=&87
  190 fldsize=&88:zflg=&89:Lend=&8A
  200 escflg=&FF:ENDPROC
  210 DEF PROCassemble
  220 FOR L%=0 TO 2 STEP 2
  230 P%=code:[OPT L%
  240 .check LDA #0:STA codeflg:STA ocrc
  250  STA ocrc+1:LDA #131:JSR byte
  260  STX Lptr:STY Lptr+1
  270 .start JSR newl
  280 .while BIT escflg:BMI escape
  290  LDY #1:LDA (Lptr),Y:BPL doline
  300 .wayout RTS:.escape BRK:BRK
  310  OPT FNequs("Escape"):BRK
  320 .bad BRK:BRK
  330  OPT FNequs("Bad program"):BRK
  340 .doline LDA #0:STA Lcrc:STA Lcrc+1
  350  STA qflg:TAY:LDA (Lptr),Y
  360  CMP #&0D:BNE bad:INY:LDA (Lptr),Y
  370  STA Lnum+1:INY:LDA (Lptr),Y
  380  STA Lnum:INY:LDA (Lptr),Y
  390  STA Lend:JSR prescan:CPY #5
  400  BCC display:LDY #4
  410 .skipspc LDA (Lptr),Y:CMP #spc
  420  BNE scan:INY:CPY LLen
  430  BEQ display:BNE skipspc
```

A step-by-step guide to using THE MICRO USER checksums

Let's assume you've chosen to type in the game, Dune Hunter, from the November 1987 issue of *The Micro User*. You've switched on your computer and the magazine is open beside it:

- Type in ten lines of the program then run whichever version of the checksum program you are using to produce the checksums for these first ten lines.
- A checksum consists of four hexadecimal digits – sometimes three or two digits – in a group followed by a space and then a single digit called the cumulative digit.
- Compare each single cumulative digit of the last ten lines displayed with the equivalent digit in the checksum list in the magazine.
- If they are all the same you know that you have made no errors so far, and you can safely type in the next ten lines and repeat the check for these.
- When there is a difference in the cumulative digits, find the first one which differs. Either that line or the one before will contain a discrepancy between the magazine and what you have typed – the line that is different can be identified because the group of four digits listed by the program will be different to those in the magazine.

Common errors to watch out for are: Confusions between a lower-case L and the digit one, digit zero and capital O, or incorrect numbers of spaces between quotes and so on.

- Once you have found and corrected the difference you should re-do the checksums for that group of ten lines so you can spot any other differences.
- Just keep repeating the enter, checksum and correction sequence until you've typed in the whole program, which will then run correctly first time, but always save it first.

Once you have become familiar and confident with the technique you can type in bigger chunks of the program before checking. In time you will be able to type in the whole program before using the checksums – but the checking method remains the same.

```
440 .scan LDA (Lptr),Y:JSR dobyte
450  INY:CPY LLen:BCC scan
460 .display:LDX Lnum:LDY Lnum+1
470  JSR pdec:LDA #spc:JSR wrch
480  LDA #ASC"=":JSR wrch:LDA #spc
490  JSR wrch:LDX Lcrc:LDY Lcrc+1
500  JSR phex:LDA ocrc:JSR lastchk
510  LDY LLen:CPY Lend:BEQ newline
520  LDA #ASC"*":JSR wrch
530 .newline JSR newl
540 .update CLC:LDA Lptr:ADC Lend
550  STA Lptr:BCC unwhile:INC Lptr+1
560 .unwhile JMP while
570 .prescan LDY Lend
580 .psLoop DEY:LDA (Lptr),Y:CMP #spc
590  BEQ psLoop:INY:STY LLen:RTS
600 .dobyte STA savebyt:CMP #qts
610  BNE notqe:PHA:LDA qflg:EOR #&FF
620  STA qflg:PLA
630 .notqe BIT qflg:BMI skpcode
640  BIT codeflg:BMI jcode
650  JSR basic:JMP skpcode
660 .jcode JSR mcode
670 .skpcode LDA savebyt:CPY LLen
680  BEQ skipcrc:STY Ltmp:LDX Lcrc
690  LDY Lcrc+1:JSR docrc:STX Lcrc
700  STY Lcrc+1:LDX ocrc:LDY ocrc+1
710  JSR docrc:STX ocrc:STY ocrc+1
720  LDY Ltmp:.skipcrc RTS
730 .basic CMP #rem:BEQ skpline
740  CMP #Lbrk:BNE xbasic:LDA #&FF
750  STA codeflg:RTS
760 .skpline LDY LLen:.xbasic RTS
770 .mcode CMP #mcom:BEQ skipcom
780  CMP #rbrk:BNE xmcode:LDA #0
790  STA codeflg:.xmcode RTS
800 .skipcom LDA qflg:PHA:LDA #0
810  STA qflg
820 .skpLoop INY:LDA (Lptr),Y:CMP #qts
830  BNE skpchk:PHA:LDA qflg:EOR #&FF
840  STA qflg:PLA
850 .skpchk CPY LLen:BEQ skpexit
860  CMP #colon:BNE skpLoop:BIT qflg
870  BMI skpLoop
880 .skpexit PLA:STA qflg:LDA (Lptr),Y
890  STA savebyt:RTS
900 .docrc PHA:STX wcrc:STY wcrc+1
910  EOR wcrc+1:STA wcrc+1:LDX #7
920 .crclp BIT wcrc+1:CLC:BPL crcskp
930  LDA wcrc:EOR #&10:STA wcrc
940  LDA wcrc+1:EOR #&08:STA wcrc+1
950  SEC
960 .crcskp ROL wcrc:ROL wcrc+1:DEX
970  BPL crclp:LDX wcrc:LDY wcrc+1
980  PLA:RTS
990 .lastchk PHA:LDA #spc:JSR wrch
1000  PLA:AND #&0F:TAX:LDA #&FF:PHA
1010  TXA:JMP notz:.pdec LDA #10
1020  BNE pnum:.phex LDA #16
1030 .pnum STX Lonum:STY hinum
1040  STA nmbase:LDA #4:STA fldsize
1050  LDA #255:STA zflg
1060 .nbit PHA:LDA #0:STA Lowrk
1070  STA hiwrk:LDX #16
1080 .next ASL Lonum:ROL hinum
1090  ROL Lowrk:ROL hiwrk:LDA Lowrk:SEC
1100  SBC nmbase:TAY:LDA hiwrk:SBC #0
1110  BCC done:INC Lonum:STY Lowrk
1120  STA hiwrk:.done DEX:BNE next
1130  LDA Lowrk:DEC fldsize:BNE nbit
1140 .out TAX:BNE notz:PLA:PHA:PHP:TXA
1150  PLP:BMI notz:BIT zflg:BPL notz
1160  LDA #spc:BNE digout
1170 .notz LDX #0:STX zflg:CMP #10
1180  BCC add:ADC #6:.add ADC #48
1190 .digout JSR wrch:PLA:BPL out
1200 .exit RTS:]:NEXT:ENDPROC
1210 DEF FNequs(s$):$P%=s$
1220 P%=P%+LEN$P%:=L%
```

Get it right!

```
10 =    0 0
20 =    0 0
30 =    0 0
40 = 236A A
50 = C8EF F
60 = FD2E E
70 = 3AF9 5
80 = 4F15 8
90 = 245B D
100 = 70B9 E
110 = EBDD 4
120 = 1687 E
130 = A0BB 7
140 = D695 0
150 = A59F E
160 = 4D12 7
170 = 4D1F B
180 = 5ED5 D
190 = 97FD F
200 = 55AA 1
210 = 98A5 C
220 = AAB9 C
230 = 7CBB 5
240 = 7334 6
250 = F159 A
260 = A5F0 8
270 = 9A6D 8
280 = FB52 D
290 = A2DC A
300 = AA8E 6
310 = 71F5 B
320 = 166B 0
330 = B16B C
340 = E3C5 2
350 = 6D40 F
360 = E3D6 8
370 = C6C5 6
380 = 144F 6
390 = B381 B
400 = D3BA 6
410 = 7E1A F
420 = DDEC 9
430 = 51FF 7
440 = 2C54 F
450 = 7C07 0
460 = A2F9 6
470 = 1D3A 0
480 = 2A1F 1
490 = 8D0F 6
500 =  A69 4
510 =  952 B
520 = 8D9D 2
530 = 109C A
540 = 4312 0
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550 = D4A9 8
560 = 1606 D
570 = D100 8
580 = 7B1C 6
590 =  573 6
600 = EFB2 7
610 = 12CE 5
620 = D058 F
630 = A3C3 9
640 = 8BC6 0
650 = 1092 4
660 = 9D39 A
670 = CF23 8
680 = D7F4 E
690 = 8759 B
700 = 49F2 7
710 = 9CF9 F
720 = 521B C
730 = 4F47 5
740 = 1303 A
750 = 28AA 9
760 = 73F4 B
770 = FCEC E
780 = 1CC4 6
790 = F2AF 2
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820 = C795 2
830 = 59D6 A
840 = D058 3
850 = 19FA 0
860 = 24EC B
870 = D682 0
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900 = 3A8E A
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1020 = 8693 0
1030 = 6D46 4
1040 = 2284 4
1050 = 48E4 F
1060 = 4FFE 8
1070 = 72EC F
1080 = FF8D 4
1090 = 664B B
1100 = 1E51 D
1110 = 444B 4
1120 = 4F4F 4
1130 = 9E0D 5
1140 = 5029 E
1150 = 3A1B 9
1160 = 5B26 1
1170 = EE96 5
1180 = F3D2 6
1190 = 27C9 1
1200 = 4ED4 2
1210 =  2E8 F
1220 = 51B2 4
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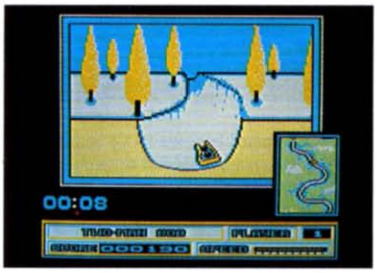
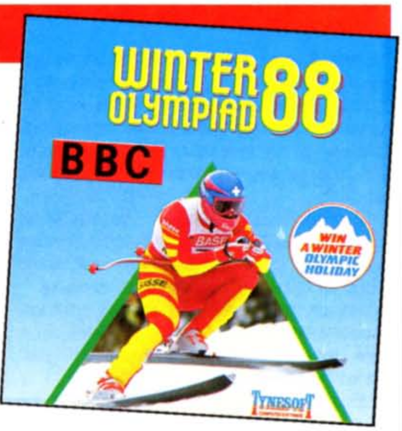
BBC Cable if purchased separately is £8.00. Software on its own: £11.00 + £1 p&p.

SOFTWARE SCENE

WINTER OLYMPIAD . . . a great way to warm up

Price: £9.95 (cassette) £14.95 (disc)
Supplier: Tynesoft, Addison Industrial Estate, Blaydon, Tyne and Wear.
Tel: 091-414 4611





IF you intend competing in the 1988 Winter Olympic Games you had better begin your training straight away. And what better way to do it than with Tynesoft's Winter Olympiad '88 – a compilation of six strenuous and skilful events for you and up to three friends to compete in.

Event number one is the bobsled run. Looking at a cross-sectional view of the bob and the course, you try to maintain the highest possible speed. This is achieved by holding the sled as high as you dare on the bends. However, stray too high and you'll find yourself doing 60 mph on your rear end.

Speed skating is the first of the keyboard-bashing events. The micro provides three different displays for this discipline – these include shots of the skater from the front and side, and a cursor moving around an oval circuit. Ignore all these and concentrate on the speed indicator at the bottom of the screen – by timing your key presses to keep this at its maximum value you'll win your first gold medal.

Whooshing down the 90 metre ski jump, you pound the keyboard for extra speed. A few seconds later you're airborne and fighting to keep your skis parallel – this is essential for both distance and marks for style.

The giant slalom is the first of the two slalom events. Looking down from a vantage point high on the mountain, you must guide the skier to the left of the red poles and to the right of the black ones – each pole struck adds a five second penalty to your time.

Next comes the Ski Slalom. Viewing the skier directly from behind, you must manoeuvre him accurately through the gates. This is the best event so far, the large sprite ducking and weaving athletically as you struggle to get him from one gate to the next.

Event number six is the Biathlon – my favourite event of the compilation – which involves alternating between cross-country skiing and target shooting. Using the Z and X keys you slowly build up speed. Just as you reach top speed you'll find that it's time to stop and take your first series of shots.

The screen is filled with a large drawing of the competitor and five targets. A cursor falls in front of each target in turn – hit the spacebar when the cursor is over the bull to register a hit. Failing to hit the bull results in a time penalty of three seconds.

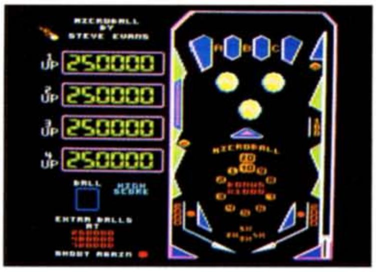
You are given three attempts at each event, but you can abort either of the last two if you are satisfied with your performance. There is also no need to qualify at one event before being allowed to compete in the next – a common feature of this type of game. Tynesoft has got it right with Winter Olympiad '88.

Carol Barrow

Sound	9
Graphics	8
Playability	9
Value for money	8
Overall	9

MICRO BALL . . . a chance to mis-spend your youth

Price: £1.99 (cassette)
Supplier: Alternative Software, Unit 3-6, Baileygate Industrial Estate, Pontefract, West Yorkshire.
Tel: 0977 797777



THE ULTRA FAST ARCADE PINBALL GAME
MICRO BALL
600
ELECTRON/BBC
199 RANGE

THE Alternative people seem to have a liking for computerised pinball tables. The new offering, Micro Ball, is a fast and furious version, well endowed with all the required sound effects and flashing lights.

As the game is loading, you will be asked which computer you are using. I would have thought that the software could have done that job. After loading, the right half of the screen becomes the pin table and the left half the score board, with up to four people involved in any one game.

Micro Ball, like real pinball, is a simple game in which a metal ball is introduced to a table by a spring-loaded plunger. It then bounces around, hitting various electromagnets which add points to your score as well as new impetus to the ball. The table slopes down to the front, and here you have two flippers to keep the ball in play. Eventually, the ball will be missed or it may go down one of the side chutes and be lost.

You get five chances to try to amass as high a score as possible and bonus balls are awarded for very good scores.

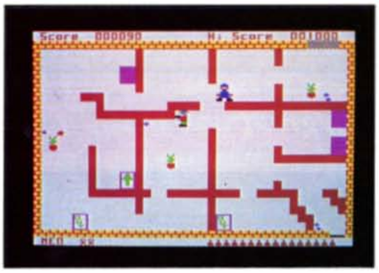
It's a pity that a high score table wasn't included, but that apart, Micro Ball represents good value for money.

Rog Frost

Sound	6
Graphics	6
Playability	7
Value for money	7
Overall	7

COPS AND ROBBERS . . . unimpressive and morally unsound

Price: £1.99 (cassette)
Supplier: Atlantis Software, 28 Station Road, London SE25 5AG.
Tel: 01-771 8642



THE latest budget-priced release from Atlantis features Light Fingers Lonegan who is raiding the headquarters of the Acme Diamond Company. Unluckily for him, he has set off the alarm system and the whole building is swarming with police. As Lonegan you must try to find all the diamonds, open the safe – which has a combination lock – and escape to your car.

The action takes place in a series of rooms linked by open doors. If you enter the lift you will be transported from one floor to another. This may involve waiting for the lift to arrive – which can be a bit hectic when the police are around.

Points are scored for collecting diamonds, which look suspiciously like asterisks, but they may be coloured blue or green. I had to guess that they were meant to be the jewels that form the heart of the game.

Additional points are scored for shooting policemen. You are armed with a 0.45 Magnum, but your poor carrying capacity necessitates frequent trips back to the get-away car to re-stock with ammunition. If you reach the cellar, the policemen are replaced by ghosts (of the Snapper type). These and the policemen are hell-bent on tracking down the villain, but are armed only with truncheons, which means they must get close to you to capture you and haul you off to jail.

The other activity to attempt is safe-breaking, which involves finding a three number code by pure guesswork. The numbers on the safe change in response to a prod from Lonegan's nose, and I haven't cracked the combination. The problem is that hanging around the safe seems to attract police in their hundreds and keeping them at bay causes the ammo to run out. The game graphics are well up to par for software of this price, with simple sprites which undergo a sort of jerky animation but the overall speed of movement is quite good. The scenery that supports the action is plain to boring.

Sound effects are frequent and raucous, but they can be reduced or turned off. The game uses standard keys (but no joystick option) and has a pause facility as well as a high score table.

In my opinion this game is wholly inappropriate. It strikes me as abhorrent that success is measured by the ability to shoot policemen or steal diamonds. This type of activity should be given a fantasy setting where the nasties to be shot are not recognisable as part of our daily environment.

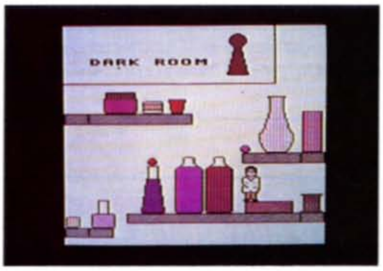
The background story spoils what is in essence a neat little budget game. Cops and Robbers was never destined to be a blockbuster – it could have been a pleasing stocking filler for the kids. As it stands, it surely must be given a miss.

Rog Frost

Sound	5
Graphics	5
Playability	7
Value for money	4
Overall	4

ELIXIR . . . searching for the taste of freedom

Price: £9.95 (cassette) £11.95 (5.25in disc) £14.95 (3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453



AFTER a gestation period of nearly two years and through a variety of incarnations Elixir has finally reached the shelves. As Cyril the Chemist, you have had the misfortune to swallow a strong potion, reducing you to the size of a bottle of aspirins.

Your only hope of ever returning to normal is to collect vitamin pills scattered around the many shelves of the shop, and eventually find the magic elixir, which is stored out of immediate reach on the top shelf.

I have to say that, initially, I was not very impressed. The sound is basic and the graphics, although large are fairly simple, with plain colours and a lack of fine detail. However, as we have all seen on earlier occasions, state-of-the-art graphics are far from essential if the game itself is good.

Elixir is basically a combination of platforms-and-ladders and an adventure. However, the unusual setting means that the platforms are the bottle-laden shelves of the shop, with objects such as strands of thread and pieces of string as the ladders.

You must collect the 40 red pills, while being wary of the many other coloured pills dotted around. A blue pill speeds you up, but a magenta pill slows you down, and a yellow one will kill you instantly. This could be a major problem for anyone playing the game in black and white!

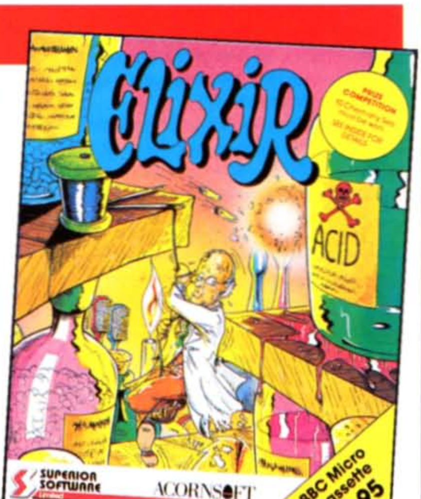
Elixir is a refreshingly different game, the most appealing aspects of which are the normally insignificant problems caused by everyday objects. You get a very strange feeling from climbing up the bristles of a toothbrush, or standing under a large bottle wondering how to climb on top of it.

A leaky bottle of acid once was simply an inconvenience, but now it is deadly. Maybe the acid-proof plaster will help? But where is it? And what do you do with the magic bean or the various other objects scattered around?

There are also a number of humorous touches, like a jar of real vanishing cream, and the ghost that pops out of the spirit bottle.

One mildly irritating feature is that if you fall too far from any point – normally by missing a jump – you will immediately drop all the way to the bottom, losing a life in the process and restarting on the bottom shelf. To get back up again proves very difficult. The simple answer, of course, is to be more careful.

I liked Elixir. It provides an interesting balance of fun and simplicity, with a number of adventure-style chaining puzzles and just enough frustration to make you have another go.



It does not have the instant appeal of Superior's other recent releases, Spellbinder and Bonecruncher, so you would be well advised to try it out first. That said, it grows on you faster than Repton's fungus. One last word, beware of the lipsticks.

Hac-Man

Sound	6
Graphics	7
Playability	8
Value for money	7
Overall	7

LIFE OF REPTON . . . *fighting with Father Time*

Price: £9.95 (cassette), £11.95 (5.25in disc) £14.95 (3.25in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453

YES, he (it?) is back. Superior Software's enormously popular Repton makes yet another appearance – his fourth – this time starring in the story of his life.

For old hands, the Life of Repton is a collection of 40 new screens for Superior's Repton 3. If you're a fan, that alone should be enough for you to go out and buy a copy.

If, on the other hand, you acquired a BBC Micro over Christmas or you've been living in the asteroid belt for the last two years, a few words of explanation will be in order.

You control Repton – a cute little reptilian character – and the object of the game is to move him around a maze collecting diamonds and killing monsters as you go. Each maze contains earth sections which you can dig through and barrier sections through which nothing can pass.

Then there are the boulders – the fun and frustration part of the game. An earth section will support a boulder but if you undermine it it will fall. If it lands on top of you it will kill you. To add a little more excitement to the plot, some barrier sections have curved tops and a boulder will roll off these if unsupported at the side. Boulders are very useful, though, as you can kill monsters by pushing and dropping boulders on to them. In fact, boulders are the only weapon you have – this is not a zap-and-blast-'em game. Fast fingers alone will not win the day.

All the graphics are large and chunky and you need to plan your moves carefully otherwise a boulder may trap a diamond or Repton himself. There are several puzzles on each screen and you can call up a map of the easier screens to help your planning.

That's the basic story. Life of Repton includes the original Repton 3 shell but not the screens. The 40 new screens load in sections of eight. The first set depicts Repton as a baby, the second shows him at school, the third is Repton in his teens, the fourth is Repton at work and the fifth is Repton as an old man. The graphics in each section have been redesigned so, in the baby set, Humpty Dumptys take the place of boulders, teddy bears take the place of diamonds, a fireplace is the skull and irate dogs and toy soldiers take over from monsters and spirits.

The graphics in the other ages are similarly appropriate – as a teenager cigarettes take the place of the skull (subtle hints at work here), at work a floppy disc is the spirit and as an OAP war medals become the diamonds. The screen designers have done an excellent job.

The Life of Repton also includes the Repton 3 screen editor which allows you to edit existing screens or construct entirely new ones. The editor is an excellent piece of software in itself and can be controlled by the keyboard, a joystick, an AMX Mouse – the AMX rom must be fitted – or a trackball.

Before you can edit a screen, however, you must complete it. When you do, you are given a five-digit code number to be used in the editor. You are also given a password for the next screen, so you don't have to start from screen one every time you play.

The instructions are generally helpful although the filename of the teenage screens is teens and not teenage as stated. Another oddity can be found in the part of the instructions which tells you the puzzles are not impossible. It says: "We assure you that Around the World can be completed."

Just a couple more niggles. The disc label said 40/80 track compatible. What it didn't say was that you have to flip the disc for the 80-track version. I had been using the 40-track side and I was extremely annoyed (to put it mildly) to find the Baby file missing.

The instructions say this loads with the main program so it's no loss when you're playing the game but unless it's on the disc you won't be able to load it into the editor. Fool that I am, I spent over an hour trying to edit the BABY screens.

The problem was compounded by the fact that the first edit code number is not 56882 as the instructions say – it's 15890. My own fault. I've reviewed enough software to know by now that if something doesn't work it's likely to be the instructions which are at fault.

Anyway, if you've a 40-track drive make sure the baby file is on your side of the disc.

The Life Of Repton
PRIZE COMPETITION
SUPERIOR SOFTWARE Limited
ACORNSOFT
Compatible with the BBC B, B+ and Master Series computers
BBC Micro and Master Series 5¼" Disc £7.95

Meanwhile, back at the program, if you manage to complete all five sets of eight screens without using a password you are eligible to enter a competition. Upon completion of a set, a congratulatory message appears along with a competition entry code-number and to enter you need all five code numbers.

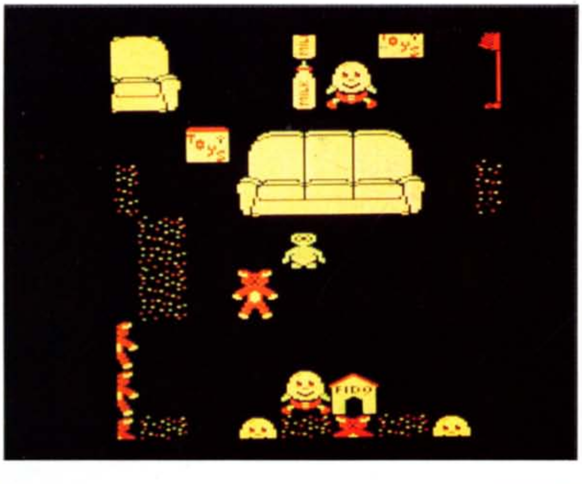
On June 30 a draw will be made from all the correct entries and the winner will receive £200, a signed certificate and a Repton 3 Fun Pack consisting of a Repton mug, a Repton badge and two Repton pens. Twenty runners-up will get the certificate and the Fun Pack but if you can't wait that long, a coupon on the instructions offers you one for £1.95.

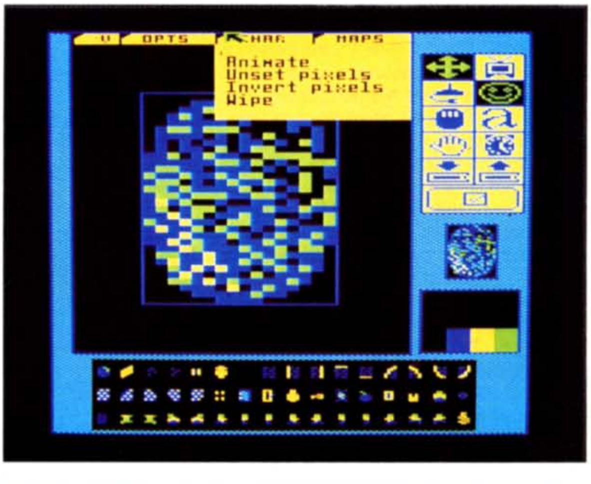
The program is compatible with the BBC Micro and Master series and a special Master version takes advantage of sideways ram to store both game and editor in memory at once.

Niggles apart – and they're nothing that a little care couldn't put right – Life of Repton is a super game which will keep you busy for days – probably weeks. If you don't have a Repton game already then buy this.

Ian Waugh

Sound	*10*
Graphics	*10*
Playability	*9*
Value for money	*10*
Overall	*9*





SPELLBINDER . . . hubble bubble toil and trouble

Price: £9.95 (cassette)
Supplier: Superior Software, Regents House, Skinner Lane, Leeds
Tel: 0532 459453

IN true adventuring tradition, Spellbinder asks you to take the role of a powerful and wise Magelord entrusted with the awesome task of banishing the evil Zorn.

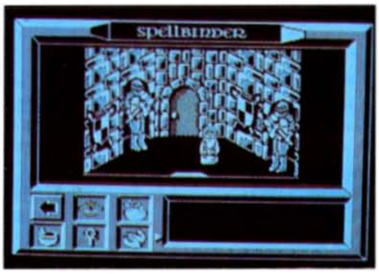
In order to do this you must search the forbidding Castle of Lorraine, find Zorn and then by mixing the ultimate spell, despatch him to the wilderness forever.

Released in the aftermath of a glut of arcade/adventure hybrids, Spellbinder has got to offer more than the usual range of features, particularly with its relatively high price tag. This it does, mainly through its icon system, its size, graphical detail and its spell-collecting and casting procedures.

Playing Spellbinder is not difficult. Your character moves freely around each room though you do have to be accurate when guiding him through the many doors.

Control is aided by a well thought-out icon system complementing the four definable keys. These icons, selected via the function keys, enable you to mix and cast spells, examine and use items to be found in the adventure, and keep tabs on what items you possess.

Spellbinder's graphics are not outstanding. However, the program designers have put some thought into littering the stone-walled castle with the sort of medieval accoutrements you would expect to see in such a place.



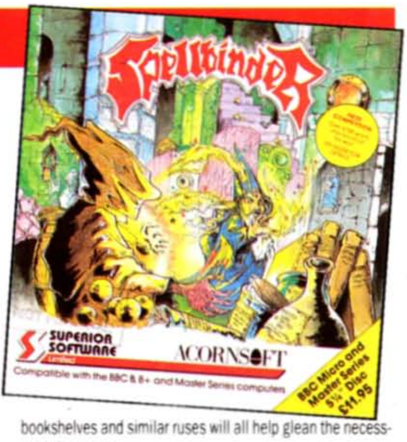
Heraldic shields and gargoyles adorn the walls and you find suits of armour, wooden barrels and sturdy chests dotted around the place, all adding atmosphere to the proceedings.

What is more impressive than the detailed graphics, is the sheer number of rooms comprising the two floors, catacomb and the dungeon of the castle.

One-way doors, secret passages and teleports all confuse the issue of exploration, but I found the colour coding of the various parts of the castle (the game is in two-colour, high resolution Mode 4) most helpful in the creation of a game map.

What make this more than a mapping and avoiding the monsters affair, are the weird and wonderful spells you are called upon to cast. First, however, you must find the ingredients for each spell – items like burnt oak leaves, toad legs and sulphur are all essential components of the common spells.

The instruction leaflet details some of the spells, but it is up to you to obtain the knowledge to create the rest. Speaking to the stone dwarves, browsing through the bookshelves and similar ruses will all help glean the necessary information.


Spellbinder
SUPERIOR SOFTWARE Limited
ACORNSOFT
Compatible with the BBC B, B+ and Master Series computers
BBC Micro and Master Series 5¼" Disc £11.95

The game sticks to some quite strict adventuring rules – it is more a problem-solving graphical puzzle than a key-bashing exercise in dexterity. The spell element, which it is absolutely vital to master if you have any aspirations of solving Spellbinder, is far from easy. It is this aspect coupled with the thought put into much of the game design which marks it out as better than most of the other, similar offerings.

Clive Gifford

Sound	***7***
Graphics	***8***
Playability	***8***
Value for money	***7***
Overall	***8***

TRAPPER . . . sticking the brick in

Price: £1.50
Supplier: Blue Ribbon Software, CDS House, Beckett Road, Doncaster DN2 4AD.
Tel: 0302 21134

THE aim in this arcade-style game is to trap monsters by pushing brick walls around to box them in, and then finally to squash them. Any contact with these beasts causes a loss of life. It's a simple theme, but difficult enough to make it surprisingly compelling.

Let's start with the bad news. My copy of the program came on what looked like a 90 minute cassette. The first five minutes seemed to be blank and on first trying to load the program I was very put out. Even on a budget-priced game, the customer deserves a tape of a suitable length and quality.

Now to the game itself. You must first enter a difficulty level – level one gives fairly slow monsters, while on level six they move a bit too rapidly.

In the first room there is just one nasty, but even he is quite hard to trap because he can sneak through corners where you can't. Speed is needed to get a high score since only a few points are scored for actually trapping the monster and lots are added by a time bonus. You gain an extra life once you have amassed 4,000 points.

Guaranteed to have you playing again and again is the time limit against which each screen must be completely cleared.

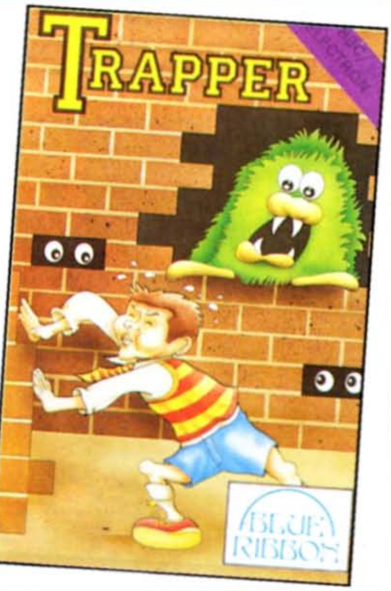
In room two there are two monsters which can cause panic to set in, and rooms three and four each add extra monsters to make things worse. The final two rooms never have more than four of the little demons on screen, but if you trap one another is born.

The game has a couple of nice touches. The meanies are utter sadists who grin from ear to ear if they catch you, and the high score table keeps a record of the selected level of difficulty.

This game is addictive and fun to play and well worth the asking price as long as you are prepared to gamble with tape quality.

Rog Frost

Sound	***4***
Graphics	***8***
Playability	***9***
Value for money	***8***
Overall	***7***



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Don't despair...

Recover erased files with Steve Turnbull's easy-to-use utility

MOST people know that if you accidentally delete a file from your disc you can get it back using a disc sector editor. Unfortunately, not everybody knows how to use one – even if they own one. Here's a file recovery utility that you can use without any knowledge at all of bits, bytes, sectors or tracks.

Your file is stored on disc in small segments called sectors, and File Rescue allows you to search through the disc until you find it. You can then load it into memory sector by sector and save it to another disc. This works with text files, Basic programs and data files – as long as you can recognise what sector belongs to your file.

Type in the listing, ensure there are no typing errors by using Get it right!, and save it. When the program is run the menu screen is displayed along with the currently selected drive number – altered using option four – and the number of tracks per disc which is changed with option five.

In the lower half of the screen the amount of memory used so far is displayed – none at first. To select one of the menu choices just press the number associated with it.

The first option allows you to search through the disc for your file. Enter a string of letters which are contained in the file you are looking for, taking care that the upper and lower-case letters will match what is on the disc. The program then searches for this string, taking about four minutes to search through a whole 80-track disc.

If the program finds the string, it displays the contents of the sector it was found in and asks if it has found the correct file – you press Y for yes or N for no. You are also informed if the string is not found on the disc.

The second option allows you to move forward and backward through the disc, using the arrow keys, displaying each sector as you go. If you have done a successful search and then enter this option the first sector displayed will be the one the search string was found at.

Once you have located your file, move backwards until you find its first sector. You begin the recovery operation by pressing the S key: This stores the current sector in memory, then automatically loads and displays the next one on the disc.

When you quit from the recover option you can save what is currently stored in memory. Make sure that you save it to a different disc otherwise you may overwrite what you are trying to recover. If you make an error and rescue the wrong file you can clear the memory using option three from the main menu.

Here are the simple steps you should follow if you find you've accidentally wiped a file from your disc:

- Find the file on disc using the search option.
- Select the recover option and use the left arrow key to step backwards through the file until you find the start.
- Save every sector using the S option until you reach the end of the file.
- Change discs and save the memory.

If you reach the situation where the memory is full but you haven't finished rescuing the file: Save the memory as prompted then use option three from the main menu to clear the memory. Change discs so that the one you are recovering the file from is in the drive and continue to save sectors from where you left off. Change discs again and save the memory using a different filename. Your old file will be in two parts and can be put together using a word processor.

In some cases you may have overwritten part of the file you want with some different data. There is no way of rescuing the overwritten material, but you can use the system above to recover what's left.

If you have overwritten the whole file there's no hope at all. If it's a Basic program that you have recovered in an incomplete form, use Basic Recover from the July 1987 issue of *The Micro User* to fix the part that's left.

Having a utility like this is no excuse for not having backups which can be loaded a lot more quickly than doing a rescue. But when the worst does happen, it's nice to know you've got an easy-to-use program to help. •

```
   10 MODE7:T$= "File Rescue"
   20 REM By Steve Turnbull
   30 REM  (c) Micro User
   40 REM -----------------
   50 h%=(TOP+&900)AND&FF00:H%=HIMEM
   60 HIMEM=h%:ON ERROR PROCerr
   70 PROCinit:ON ERROR PROCerror
   80 REPEAT CLS:PROChd("Main Menu")
   90 FOR Y%=1 TO opts
  100 PRINTTAB(ox%,4+Y%)red$;Y%ylw$opt$(
Y%)
  110 NEXT:REPEAT PROCmemused
  120 PRINTTAB(25,oy%-3)cyn$drv
  130 PRINTTAB(25,oy%-2)cyn$traks
  140 PROCcn(grn$+"Press key for your ch
oice : ",oy%+2)
  150 Q%=FNin(opts$):IF Q%=3 PROCwipe
  160 IF Q%=4 PROCdrive
  170 IF Q%=5 PROCswap
  180 UNTIL Q%=1 OR Q%=2 OR Q%=6
  190 IF Q%=1 PROCsearch
  200 IF Q%=2 PROCrecover
  210 IF Q%=6 quit=TRUE
  220 UNTIL quit:PROCquit:END
  230 DEF PROCerror:PROCcoff
  240 IF ERR=17 ENDPROC
  250 ON ERROR OFF:PROCquit
  260 DEF PROCerr:PROCcon
  270 REPORT:PRINT" at line ";ERL:END
  280 DEF PROCquit:CLS:*fx4
  290 PROCcon:PROChd("End"):*FX18
  300 PRINT':@%=10:ENDPROC
  310 DEF PROCinit:PROCcoff:*FX4,1
  320 READ opts:DIM opt$(opts)
  330 FOR O%=1 TO opts:READ opt$(O%)
  340 opts$=opts$+STR$O%:NEXT
  350 ox%=2:oy%=O%+4
  360 c$=CHR$&88+CHR$&88+CHR$&89+CHR$&89
  370 copy$=CHR$&87:tab$=CHR$9:cr$=CHR$1
3
```

```
  380 buff1=&B00:buff2=&C00:buff3=&A00
  390 quit=FALSE:ctrl=&70:PROCassem
  400 sects=10:traks=40:sct=2:trk=0
  410 drv=0:P%=999:@%=5:J%=0
  420 red$=CHR$129:grn$=CHR$130
  430 ylw$=CHR$131:blu$=CHR$132
  440 mag$=CHR$133:cyn$=CHR$134
  450 wht$=CHR$135:ENDPROC
  460 DATA 6
  470 DATA Search disc for data
  480 DATA Recover data from disc
  490 DATA Wipe memory clean
  500 DATA Select disc drive
  510 DATA Number of tracks
  520 DATA Quit
  530 DEF PROCcoff:LOCAL B%
  540 DEF PROCcon:LOCAL B%:B%=1
  550 VDU23,1,B%;0;0;0;:ENDPROC
  560 DEF PROChd(t$):VDU26,12
  570 PROCdb(grn$+T$+" _ "+t$+" ",0)
  580 ENDPROC
  590 DEF PROCdb(t$,Y%)
  600 PROCcn(CHR$141+t$+" ",Y%)
  610 PROCcn(CHR$141+t$+" ",Y%+1)
  620 ENDPROC
  630 DEF PROCcn(t$,Y%)
  640 LOCAL X%:X%=(40-LEN(t$))DIV2
  650 PRINTTAB(X%,Y%)t$;:ENDPROC
  660 DEF FNin(k$):LOCAL I%:*FX21
  670 PROCcon:REPEAT I%=INSTR(k$,GET$)
  680 VDU-7*(I%=0):UNTILI%:PROCcoff:=I%
  690 DEF PROCrd(d%,t%,s%,b%):W%=&53
  700 DEF PROCwrt(d%,t%,s%,b%):W%=&4B
  710 ctrl?0=d%:ctrl!1=b%:ctrl?5=3
  720 ctrl?6=W%:ctrl?7=t%:ctrl?8=s%
  730 ctrl?9=&21:PROCdfs(ctrl,10)
  740 ENDPROC
  750 DEF PROCdfs(C%,e%)
```

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◀ From Page 37

```
 760 LOCAL A%,X%,Y%,R%
 770 A%=&7F:X%=C%:Y%=X%DIV256
 780 REPEAT R%=R%+1:CALL &FFF1
 790 UNTIL C%?e%=0 OR R%=10
 800 IF C%?e%=0 ENDPROC
 810 PROCcn("Disc Error!!",VPOS+1)
 820 PROCcn("Press Space to continue or
Escape",VPOS+2)
 830 Z%=FNin(" "):ENDPROC
 840 DEF PROCrecover:PROChd("Recover")
 850 IF NOT FNfull PROCsaving
 860 IF J%>0 PROCmemsave
 870 ENDPROC
 880 DEF PROCsaving
 890 PROCcn(cyn$+"Use [ and ] to change
sector, ",5)
 900 PROCcn(cyn$+"S to save, or Q to qu
it: ",6)
 910 LOCAL F%,X%,Y%:X%=POS:Y%=VPOS
 920 REPEAT PROCmemused
 930 PROCrd(drv,trk,sct,buff1)
 940 PROCscreen(buff1):VDU31X%Y%
 950 K%=(FNin(c$+"SsQq")+1)DIV2
 960 IF K%=3 PROCsave
 970 IF K%=2 PROCinc
 980 IF K%=1 PROCdec
 990 UNTIL (K%=4) OR FNfull
1000 PROCmemused:ENDPROC
1010 DEF PROCsave
1020 !ptr=J%+HIMEM:CALLshift2
1030 J%=J%+&100:SOUND 1,-7,40,1
1040 PROCinc:ENDPROC
1050 DEF FNfull=((J%+HIMEM)=H%)
1060 DEF PROCmemused:LOCAL L%,j$
1070 IF FNfull j$=red$+"Memory full"+wh
t$ ELSE j$=grn$+"Memory used"+wht$
1080 PROCcn(j$,19):L%=38*J%DIV(H%-HIMEM
)
1090 j$=grn$+STRING$(L%,CHR$&FF)
1100 IF L%>30 j$=ylw$+MID$(j$,2)
1110 IF L%>35 j$=red$+MID$(j$,2)
1120 PRINTTAB(0,20)j$SPC(38-L%):ENDPROC
1130 DEF PROCmemsave
1140 PROCcn(ylw$+"Do you want to save n
ow? ",22)
1150 IF FNin("YyNn")>2 ENDPROC
1160 PRINTCHR$13SPC39:PROCcn(ylw$+"Chan
ge disc, then press Space...",22)
1170 Z%=FNin(" "):PRINTCHR$13SPC39CHR$1
3;
1180 PRINTmag$"Enter filename:"red$;
1190 F$=FNfnm(12):PROCcli("SAVE "+F$+"
"+STR$~HIMEM+"+"+STR$~J%+" 0 0")
1200 ENDPROC
1210 DEF FNfnm(L%):LOCAL F$,X%,Y%
1220 X%=POS:Y%=VPOS:REPEAT PROCcon
1230 PRINTTAB(X%,Y%)SPC(LENF$);
1240 INPUTTAB(X%,Y%)F$:PROCcoff
1250 UNTIL LENF$<=L%:=F$
1260 DEF PROCscreen(!ptr)
1270 VDU28,3,17,37,8,12
1280 CALL ascout:VDU26:ENDPROC
1290 DEF PROCwipe:IF J%=0 ENDPROC
1300 PROCcn(ylw$+"Are you sure?"+wht$,1
5)
1310 IF FNin("YyNn")<3 J%=0
1320 PRINTCHR$13SPC40;:ENDPROC
1330 DEF PROCdrive
1340 drv=drv+1:IF drv=4 drv=0
1350 ENDPROC
1360 DEF PROCswap
1370 IF traks=80 traks=40 ELSE traks=80
1380 ENDPROC
1390 DEF PROCsearch
1400 PROChd("Search")
1410 PROCcn("Enter a distinctive string
 from the",VPOS+2)
1420 PROCcn("file you wish to find:",VP
OS+1)
1430 Y%=VPOS+2:PROCcon
1440 REPEAT INPUTTAB(0,Y%)$buff3
1450 UNTIL $buff3>"":?leng=LEN$buff3
1460 PROCcn(CHR$136+"Searching...",VPOS
+2)
1470 M%=sects*traks-1:trk=0:sct=2
1480 PROCrd(drv,trk,sct,buff1)
1490 REPEAT REPEAT PROCinc
1500 PROCrd(drv,trk,sct,buff2)
1510 A%=USR(cmp)AND&FF:IF A% CALLshift1
1520 UNTIL FNend:IF A%=0 PROCthis_it
1530 UNTIL FNend:IF A%<>0 PROCnot_fnd
1540 ENDPROC
1550 DEF FNend=A%=0ORV%=M%OR!buff1=&E5E
5E5E5
1560 DEF PROCthis_it
1570 PROCdec:PROCscreen(buff1)
1580 PROCcn(red$+"Is this the file you
want? ",20):A%=FNin("YyNn")>2
1590 PROCcn(STRING$(28," "),VPOS)
1600 IF A% PROCcn(ylw$+CHR$136+"Continu
ing search...",VPOS):CALLshift1
1610 ENDPROC
1620 DEF PROCnot_fnd
1630 PROCcn(red$+"I could not find this
 string. ",20)
1640 PROCcn(ylw$+"Press SPACE to contin
ue... ",22)
1650 Z%=FNin(" "):ENDPROC
1660 DEF PROCinc:sct=sct+1
1670 IF sct=sects trk=trk+1:sct=0
1680 IF trk=traks trk=0:sct=2
1690 V%=trk*10+sct:ENDPROC
1700 DEF PROCdec:sct=sct-1
1710 IF sct=1 IF trk=0 sct=-1
1720 IF sct=-1 sct=sects-1:trk=trk-1
1730 IF trk=-1 trk=traks-1
1740 V%=trk*10+sct:ENDPROC
1750 DEF PROCcli($&700):LOCAL X%,Y%
1760 Y%=7:CALL&FFF7:ENDPROC
1770 DEF PROCassem:LOCAL L%,P%
1780 DIM code &80
1790 oswrch=&FFEE:osnewl=&FFE7
1800 ptr=&88:leng=&8A
1810 FOR L%=0 TO 2 STEP 2
1820 P%=code:[OPT L%:.cmp
1830  LDA #buff1 MOD256:STA ptr
1840  LDA #buff1 DIV256:STA ptr+1
1850 .clp1 LDY #&00:.clp2 LDA (ptr),Y
1860  CMP buff3,Y:BNE notsame:INY
1870  CPY leng:BNE clp2:LDA #&00:RTS
1880 .notsame INC ptr:BNE clp1
1890  LDA #&FF:RTS
1900 .shift1 LDY #0:.slp1 LDA buff2,Y
1910  STA buff1,Y:INY:BNE slp1:RTS
1920 .shift2 LDY #0:.slp2 LDA buff1,Y
1930  STA (ptr),Y:INY:BNE slp2:RTS
1940 .ascout LDY #0:.asclp TYA
1950  AND #&1F:BNE nocr:JSR osnewl
1960 .nocr LDA (ptr),Y:JSR ascii
1970  JSR oswrch:INY:BNE asclp:RTS
1980 .ascii CMP #32:BCC dot
1990  CMP #127:BCS dot:RTS
2000 .dot LDA #ASC".":RTS
2010 ]:NEXT:ENDPROC
```

This listing is included in this month's tape & disc offer. See order form on Page 165.

Get it right!

```
  10 = E8D9 9 | 350 = 40C3 1 | 690 = D59E 5
  20 =    0 9 | 360 = 57DB 5 | 700 = 54D0 3
  30 =    0 9 | 370 = D3B1 2 | 710 = 4436 3
  40 =    0 9 | 380 = D140 E | 720 = 25E9 9
  50 = 5D55 9 | 390 = 58B5 0 | 730 = E33E 3
  60 = FB45 7 | 400 = 7E50 C | 740 = ED0F 5
  70 = 1248 5 | 410 = 3D44 1 | 750 = 447A D
  80 = 490E C | 420 = 7ACD C | 760 = 7DD5 2
  90 = 1780 B | 430 = 9F0E 3 | 770 = E7E5 9
 100 = 5268 3 | 440 = 2ABC 7 | 780 = 4F8C 3
 110 = B71A 6 | 450 = EEA4 9 | 790 = 26B9 0
 120 = CCE5 F | 460 = 4086 5 | 800 = E943 6
 130 = 7D76 9 | 470 =  14F C | 810 = 1CD2 C
 140 = 20C1 3 | 480 = 4410 2 | 820 = D307 E
 150 = 65CE 8 | 490 = 2E7F 8 | 830 = AEE5 7
 160 = 6727 A | 500 =  559 C | 840 = 4042 7
 170 = 5E7B D | 510 = 9603 6 | 850 = C661 C
 180 =  EFA 6 | 520 = 1835 8 | 860 = 4FCA 6
 190 = E3CD C | 530 = 648E 9 | 870 = ED0F A
 200 = EF5B 1 | 540 = A7C6 9 | 880 = B536 9
 210 = 8307 5 | 550 = B3B3 D | 890 = 96CD F
 220 = 9461 9 | 560 =  71C 3 | 900 = 2924 A
 230 = 6307 B | 570 = 103C 7 | 910 = C895 A
 240 =  E65 D | 580 = ED0F D | 920 = 4628 F
 250 = 561A E | 590 = B786 7 | 930 = 1429 8
 260 = DBBB 6 | 600 = 91A9 5 | 940 = 1B88 F
 270 = FA32 B | 610 = E296 6 | 950 = 492F 1
 280 = 2F24 4 | 620 = ED0F D | 960 = D6BA 2
 290 = D610 5 | 630 = 179A 8 | 970 =  3C1 7
 300 = 8BDF E | 640 = B1FB 4 | 980 = 538A E
 310 = EDFC 7 | 650 = DF37 B | 990 = 5500 D
 320 = 4FA8 4 | 660 = 59EE F |1000 = 8F9B A
 330 = 5422 D | 670 = AA44 A |1010 =  EB7 A
 340 = C38A 5 | 680 = 8054 C |1020 = 478D A
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1030 = 7223 8 | 1370 =  D50 7 | 1710 =  75B A
1040 = 95BE E | 1380 = ED0F 9 | 1720 = 38E3 8
1050 = DC9E A | 1390 = 429B 1 | 1730 = 2305 D
1060 = E41D 0 | 1400 = F40D F | 1740 = 2FF2 E
1070 = CC52 E | 1410 = 4947 8 | 1750 = E297 3
1080 = A497 1 | 1420 = 6726 9 | 1760 = 50E0 E
1090 = 4219 2 | 1430 = 7DBE 7 | 1770 = 1C70 5
1100 = B1E5 6 | 1440 = FC37 6 | 1780 = 3AFB 8
1110 = 18D3 1 | 1450 = D901 1 | 1790 = DB27 2
1120 = 4332 4 | 1460 = C42D 5 | 1800 = BBD2 1
1130 = 79F5 E | 1470 = 3225 8 | 1810 = AAB9 6
1140 = BAF0 8 | 1480 = 1429 3 | 1820 = 67ED 4
1150 = EBFB F | 1490 = B2F3 F | 1830 = D8DB C
1160 = C748 2 | 1500 = 417A 2 | 1840 = EC34 8
1170 = F940 7 | 1510 = D78A C | 1850 = 7F41 7
1180 = 267C 5 | 1520 = 5789 F | 1860 = D8B2 1
1190 = CB31 2 | 1530 = C888 4 | 1870 = 3D08 C
1200 = ED0F A | 1540 = ED0F B | 1880 = 9235 2
1210 = 5B1B A | 1550 = FBAC 0 | 1890 = FFDE 0
1220 = 69E6 B | 1560 = 6DFE 4 | 1900 = CFC2 2
1230 = 14D3 5 | 1570 = D9EB 8 | 1910 = D2DE 7
1240 = D8A5 5 | 1580 = 8172 6 | 1920 = BDB5 0
1250 = 3CFF D | 1590 = AB9A 0 | 1930 = 5332 3
1260 = 3B51 E | 1600 = 2C15 F | 1940 = AF41 8
1270 = C1CD 7 | 1610 = ED0F 8 | 1950 = 4954 4
1280 = 8ED6 7 | 1620 = EC44 9 | 1960 = B0EF C
1290 = DE5C A | 1630 = FA04 1 | 1970 = F9E3 4
1300 = A2B2 2 | 1640 = CEB6 A | 1980 = A9F7 5
1310 = 667D 4 | 1650 = AEE5 C | 1990 =  7C9 7
1320 = C6B5 6 | 1660 = C931 5 | 2000 = C829 8
1330 = B04A 9 | 1670 = 35E4 B | 2010 = 953B 0
1340 = 863A 8 | 1680 = 4C45 C |
1350 = ED0F 3 | 1690 = 2FF2 E |
1360 = 2704 E | 1700 = 3634 A |
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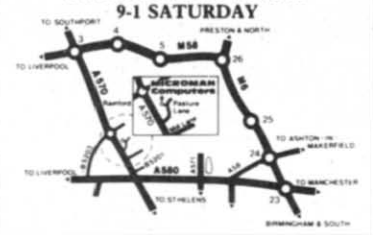

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PROBLEM SOLVED

Kaga connections

I REFER to your reply in the September issue of *The Micro User* to queries regarding the use of existing colour monitors on an Archimedes.

I have a Kaga Vision III, bought in March 1984, which has an analogue amplifier and, on the face of it, should work with the Archimedes. But I'm not sure whether the RGB outputs are compatible with the monitor input requirements.

I do not entirely understand your comments regarding a Kaga monitor, so could you please be more specific on this matter and also give details of any modification or adaptation that I could embody in order to use my existing monitor and get the full colour range? – **P.B. Walker, Canterbury, Kent.**

● *From my experience with Kaga monitors I have found there is a dead range in the linear input. That is, no screen display is produced until there is at least 0.7 volts input, and after that the bigger the signal the brighter the display. So if you were to use this directly with an Archimedes, some of the darker shades would not be visible.*

The answer would seem to be to add a steady 0.7 volts to the signal as it goes into the monitor. However I must emphasise that I have not tried this with an Archimedes, but have done with the Chameleon colour palette I designed some time ago.

If I wanted to connect a Kaga monitor to an Archimedes I would first try a direct connection to see how much I was missing and then try to add the DC offset.

The simplest way would be to take one resistor – about 330Ω – from the video input of the monitor to earth and another – about 1K8 – to +5 volts. Then connect the input to the Archimedes through a 50μF capacitor to prevent the DC being fed back into the computer.

This needs to be done on each of the R,G, and B signal lines, and the resistors should be 1 per cent tolerance otherwise there is a chance of a slight colour cast being produced.

Daisy dilemma

I HAVE a BBC B and have been offered the use of a Commodore daisywheel printer. Is it possible to interface this printer to my micro?

I do have the ability to make up the leads to connect them together so any relevant information you can give me, or where I may be able to obtain such information, would be appreciated. – **S.Rae, Newcastle upon Tyne.**

● *The problem with Commodore equipment is that it works to its own unique standard – and the daisywheel printer is no exception. The interface is a mixture of serial and IEEE conventions, and so it will not be possible to drive it directly from your BBC Micro. However, in principle, it is always possible to interface anything to anything.*

In this case it should be feasible to make up some extra circuitry to plug into the user port to talk to the printer. But I don't know if you will consider that the time and effort this will take worthwhile.

If you look at the Commodore 64 Programmers' Reference Guide you will see the sorts of signals the printer accepts, and you may be able to design your interface and software to drive it.

Quantel art

I HAVE always been very interested in computer art. Having seen the Quantel paintbox recently on television I was convinced I needed a video digitiser, and your Body Building one from the May issue of *The Micro User* seemed adequate and within my budget.

I use AMX Art on the Master. Is it possible to convert the digitised screen into Mode 1 or 4? If a routine is printed I will buy one. Blackmail? Who, me? – **Clive Gringras, Cheadle, Cheshire.**

● *If you take a look at this very issue of* The Micro User *you will see that is exactly what I have done. Never let it be said that I respond to blackmail – but I expect your order soon.*

Serial keys

I RECENTLY acquired a serial keyboard which I would like to connect to my BBC B via the RS432 port. I know I will have to use *FX2,1 but I am having trouble deciding which wires go where.

At present the keyboard cable terminates with a 6 pin Infone-style plug, but only four of the pins are used. According to the manual they are wired up as follows:

Pin	Signal
2	+12 volts
3	0 volts
4	KBDATD;L
5	0 volts

None of the current ratings are specified. – **Andrew Born, Huddersfield, West Yorks.**

● *Pin 2 should be connected to the 12 volts auxiliary power supply on the underside of your computer, pin 4 to the data input of the RS423, and connect the CTS and RTS pins together.*

There is a diagram showing the connections in the User Guide. A word of caution however. As there is only a single power supply input this might not work as the serial interface requires a signal that goes above and below ground.

It could be that there is a voltage inverter inside the keyboard to generate this, but if not you might have to make up a small circuit to obtain this type of signal from the single-ended one you have.

Alternatively you could bypass the RS432 input buffers and feed it straight in at TTL levels – assuming that is what you have. If you only get a single-ended 12v signal this will have to be reduced with a transistor before by-passing the input buffers.

Key trouble

AS the keys on my BBC Micro were not responding to the usual typing pressure I removed the keyboard and all the keycaps and I gave it a good clean with a spray-duster. When I replaced everything I was pleased to see the keys responded extremely well, apart from the * key, which stuck when it was pressed. I gave it another good blow with the duster and it worked fine without the cap, but when replaced continued to stick.

As this key is used in many games you can imagine my frustration. Does it mean a new keyboard, or can I replace just that particular key? Or even better can it be fixed without any new parts? – **Stephen Youell, Sandy, Bedfordshire.**

● *The problem sounds mechanical rather than electrical, so you could try mechanical solutions. A little Electrolube lubricant might do the trick, but if not you can replace the individual key. However, I know of five different types used during the manufacture of the BBC Micro, so make sure you obtain the correct one.*

An alternative is that you could swap your sticking key with a little-used one like the tilde and up arrow. Just unsolder the switches and swap them round.

Master difference

I HAVE a peripheral which stores data in an interval ram, and on the press of a button feeds it, in the form of Ascii codes, into the user port of a BBC Micro.

There are two handshaking lines: One is controlled by the peripheral and goes to logic low when data has been set on the output lines, while the other is controlled by the computer and goes low when the data has been accepted.

It remains there for the period during which the output code is valid and then goes high to wait for new data. The Ascii codes are fed to the output lines sequentially.

The device works perfectly with the

Turn to Page 42 ▶

◀ **From Page 41**

BBC B and B+, but it will not dump on the Master 128. I have checked it on several Masters, and the result is always the same.

Please can you explain why this should be and what can I do to put matters right? What is the difference between the B+ and the Master in this respect? – **Albert E. Yeo, Aldridge, Walsall.**

● *There is no difference between any of the versions of the BBC Micro with regard to the user port. The only reason for this sort of thing not to work on the Master is the driving software: It is probably doing something illegal, like assuming it knows the contents of a vector instead of directing through it.*

It could be that you are running ADFS on the Master and your software will not cope with that filing system. Get back to the manufacturers or write your own data grabbing routine.

Monitor mod

I HAVE a colour monitor – a Microvitec Cub 1431MS with RGB input. Is it possible to modify it for use with video output from a video recorder?

Also, my Acorn 100k disc drive is working with other BBC Micros but not mine. I suspect the power supply will drive the micro but has insufficient power left for additional equipment, so I would like to build a separate power supply for this and future enhancements. What are the power requirements of this drive?

I have a basic knowledge of electronics and some constructional experience. – **Peter Bunney, Broughton-in-Furness, Cumbria.**

● *It is not possible to convert your monitor to accept a composite video input, but you can buy converter boxes for about £60 to convert a composite video signal into analogue RGB. Your specialist video supplier should be able to supply details.*

You can then plug this into your monitor, providing you have converted it to accept analogue signals, as described in the June 1987 issue of Body Building. However, the lack of a functioning brightness control could be a disadvantage when viewing video signals.

Most DIY electronic books will have a section on building power supplies, so take a look in your local library. The current requirements of drives differ, but typically you need one that can deliver 5 volts and 12 volts at one amp each.

Terminal emulator

OUR school has been kindly donated an old ICL PC – unfortunately without detailed technical documentation. On examination it seems to be a multi-user system, and we have been given the main computer with one terminal. The manual says they are joined by an RS232 link, but it is the 25-pin type.

It would be nice if we could use BBC Micros to emulate other terminals using the RS232, as they might be able to access a hard disc in the main unit. If this does not work, could the hard disc be removed and plugged directly into the 1MHz bus on a BBC Micro? – **A. Gibbons, Torquay, Devon.**

● *If you look at chapter 38 of the User Guide you will find a diagram of how to construct a lead between the BBC Micro's RS423 socket and a 25-way D-type connector. You will then need to communicate between the two, and for this you must have some communications software such as Commstar,*

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Mini Office II or another terminal emulator.

What you cannot do is plug the hard disc directly into the 1MHz bus. I assume you think you can because the connectors are both 34-way IDC, but if you try this you could damage both your computer and the drive. It is beyond the scope of a letters reply to tell you how to interface this drive to your computer, as it is a major undertaking.

Slowing down

I UNDERSTAND that there is a method of adjusting the internal clock of my BBC Master, which is running slow. Can you please tell me exactly how to do this, bearing in mind that the inside of a computer is a completely unknown world to me? – **F.W. Kennet, Sheerness, Kent.**

● *Open your Master and locate the batteries. Follow the wire from them to a chip marked 146818, perhaps with some other numbers on it as well. This should be marked IC11 on the board.*

Close to it is a variable capacitor marked on the board as VC1: It is round and has a small screw slot on the top. Alter this screw by about an eighth of a turn clockwise and see how your computer keeps time. If it is worse, turn it in the other direction. You can't do any harm wherever you set this control, so experiment to find the best position.

Analogue RGB

I OWN a Microvitec 1451 AD and would like to know if it is possible to convert it to analogue RGB. If this is possible presumably I could then use it with an Archimedes, with the appropriate lead conversion. – **W. Davis, Launceston, Cornwall.**

● *If you look in the June 1987 Body Building article you will see the links you need to change to convert a Microvitec Monitor from TTL inputs into analogue RGB inputs.*

This will allow it to be used with an Archimedes and the results are very good, although the brightness control will be rendered inoperative. This advice seemed to throw Microvitec into somewhat of a panic when I first suggested it in the September issue of The Micro User. *They issued a press release advising against the modification being attempted on safety grounds. However the problem is not that the modification in itself is unsafe, but that in performing it you might get an electric shock unless you take great care.*

This is because in monitors high voltage capacitors remain charged long after the set has been switched off, and if you manage to touch the right (or wrong) place it could give you a jolt. Microvitec also said the modification would not yield high quality results.

They based this on the paper specification of both the Archimedes and their monitors, which show that you need about 3.5 volts peak of analogue signal. The Archimedes only outputs 0.7 volts, but what they failed to appreciate is that this is produced only when terminated by 75 ohms. So when driving a high impedence monitor like a Microvitec the Archimedes produces a much higher voltage.

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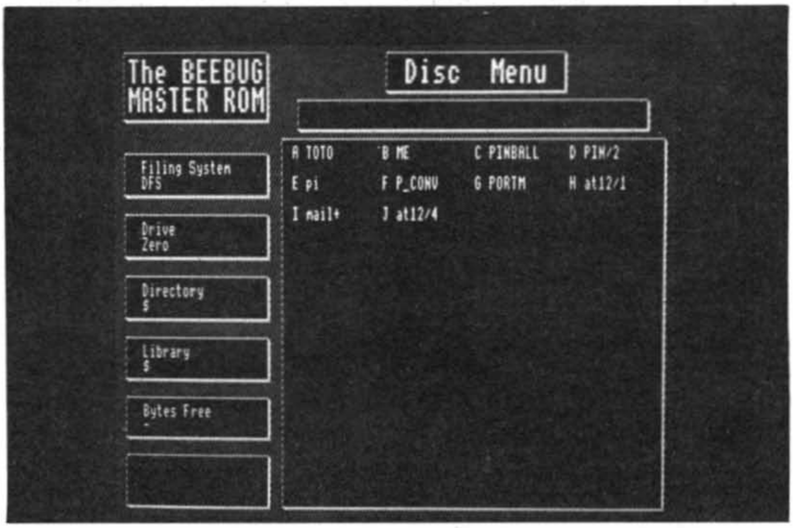
Mastering the Master

Complex computers need simple front-ends: Mike Mahon assesses a possible solution



```
The BEEBUG          Disc  Menu
MASTER ROM

Filing System   A TOTO    B ME      C PINBALL  D PIM/2
DFS             E pi      F P_CONV  G PORTM    H at12/1
                I mail+   J at12/4
Drive
Zero

Directory
$

Library
$

Bytes Free
-
```

MASTER Rom is a new utility rom from Beebug which, to quote their advertising, "... is a powerful new rom developed to enhance the ADFS, sideways ram and real-time features of the Master 128." It also provides users of the original BBC and B+ Micros with a number of advanced facilities, particularly if sideways ram and the ADFS are fitted.

Typing *HELP MASTER-ROM or *HELP MAS. offers no less than 48 star commands which together with three screen panels provide a comprehensive set of utilities. The commands may be grouped into five major classes as outlined below:

Control panel

This screen, entered by *P, provides an immediate visual display of the machine settings of the Master (start-up mode, disc options, keyboard and printer status) together with an analogue and digital clock, day and date.

You may alter any or all of these features simply – via the cursor and Shift keys, or toggle to the Disc Menu panel with Control+T. Status settings may also be saved or reloaded from disc. This provides a fairly simple, but I think essential, front-end controller for the Master.

Disc menu

This option, as you might expect, displays the current setting of the filing system, drive number, directory, library and disc bytes free. It also gives you an interactive disc catalogue allowing you to move easily through directories on the ADFS and to autoload programs or rom images from disc. A file marking option is also available for block deletion, copying or renaming files. Other disc commands include backup, formatting, compare and merge utilities plus a useful autosave feature.

Diary and alarm

As well as providing an instant monthly or yearly calendar on demand this gives you the facility to create a disc-based diary for any year up to 1999. Messages or alarms can be set for any day and you will be reminded at switch on by a friendly sound that a message is awaiting in your diary.

Ram disc

A ram disc for fast access to programs or files up to 64k in length may be set up using the star commands RBLOAD, RBSAVE, RBCHAIN, RBRUN, RBDUMP, RBINFO and so on. This is particularly useful for animated screen programs and mimics the speed of a hard disc.

Printer buffer

This controls the sideways ram via star commands so that a printer buffer up to 64k long may be configured in the Master. You can then continue to use the micro while long documents are still printing from the buffer.

The 32k Master Rom is supplied on a small carrier PAL board and comes complete with a 55-page A5 spiral-bound manual neatly packaged in a video cassette type box. The manual is of high quality both in presentation and content.

Overall the facilities are well implemented and provide the Master or upgraded BBC Micro user with a fair degree of control over his or her system. The only niggle is that if the Master Rom is set as the default language on switch on, the disc menu screen appears and the drive is activated whereas the panel status and clock menu would be more preferable.

Master Rom may be compared to the ACP Control Panel reviewed in the September 1987 issue of *The Micro User*, in offering control of machine settings and disc menus. It lacks the calculator and user-defined screens of ACP but provides instead a comprehensive diary option, so giving a healthy choice in the Master front-end market depending on the preferences of the buyer.

Product: Master Rom
Price: £39.00 (32k eprom)
Supplier: Beebug Ltd, Dolphin Place, Holywell Hill, St. Albans, Herts AL1 1EX.
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Take a note – it's wysiwyg music!

IN spite of all its wondrous capabilities, if you show a computer a sheet of music its screen is liable to turn white. Or perhaps that's just the reflection of the programmer's face.

Music is easy enough to enter into a computer – and it's not too difficult to get it to play it back, either – but rare is the program which lets you do this using traditional notation. Ample and the Hybrid Music System – see the review in the September issue of *The Micro User* – is a notable exception.

Music notation processing has not yet achieved the sophistication of word processing. It's a far more complex and difficult task and, admittedly, the potential market is nowhere near as large as that of a good word processor.

But it's precisely because a computer allows you to move notes around on the stave before committing yourself to their placement that it's such a good idea.

Mid-Sussex's Music Processor, now in its second incarnation, is a disc-based set of programs which allow you to enter and edit music on up to eight staves at once. Model B and Master versions are available on 40 and 80 track discs. It's purely a notation processor, not a music programmer, although it will play back a one-part single line melody, albeit sometimes with a hiccup.

The program runs in Mode 4 and on screen you basically get what you see – a wysiwyg music processor! The full screen will print out as half an A4 sheet.

Ian Waugh composes himself to assess this music processor upgrade

Files are saved to disc – a double drive helps – and they can be loaded again for further editing or transposition. Individual parts can be extracted from a score containing several parts, too.

The program writes to the system disc extensively which made me a little uneasy as it's copy-protected so you can't make a backup.

The editor is fairly easy to use in practice although I thought the choice of keys rather idiosyncratic. All the symbols can be moved around the screen before fixing, and deletion of notes is very easy.

You begin with a blank screen and call a stave on to it by pressing S. You can shift it up and down and from left to right before fixing it but once it's placed it's there for keeps.

You can't push notes off one stave and on to the next and if you discover you've missed out a bar – for example, on the first stave – you may have to start again. Although you can copy one section of a stave to another.

You enter a clef by pressing T for Treble, U for Bass, V for Alto or W for Tenor. Like the stave, this can be moved, too, before fixing. Pressing X inserts the top figure in the time signature and Y gives you the bottom one.

Notes are entered by pressing the note name, A to G. You can alter the pitch by pressing a different letter or by using the cursor keys to move the note up and down the stave. Chords are very easy to enter: R (Raise) adds a sharp and L (Lower) adds a flat. These are also used to enter the key signature. N produces a natural, * gives you a double sharp and + provides a double flat.

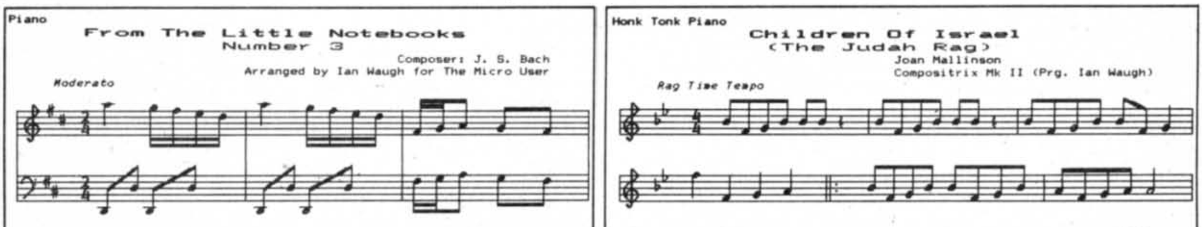
The numeric keys are used to select the note durations and each new note appears as a crotchet (quarter note). It would have been helpful, perhaps, if subsequent notes offered the last duration.

Extra dots can be added – with the H key – for double dotted notes and for repeat bar markers, and stems can be flipped or removed using the J, K and I keys.

One of the problems with many of the few programs which use traditional notation is the way they handle beamed notes. Most ignore the problem completely and let each note and its duration stand alone, much like a vocal score.

The Music Processor, however, lets you join notes with quaver, semiquaver

Turn to Page 48 ▶



Sample scores produced using the Music Processor

◀ *From Page 47*

and demisemiquaver beams. It uses the same process you would use: You enter the notes first then work backwards adding the beams. It works well and it's not difficult at all.

If you want to edit a beamed note you must remove the beam first, which is rather a niggle if you only want to adjust the pitch.

There are Stretch and Squeeze commands to help space your music across the stave, plus an automatic formatter which spaces everything out evenly. You may still need to adjust some symbols after using this however as, for example, it will space the gap in between a double bar sign.

The programs are written in Basic and the key response is sluggish, if not downright lazy, at times.

There are several things the Music Processor can't do. Its major limitation is its inability to tie notes – curves are often a problem on computers.

You can't add text, chord names, musical instructions or symbols either, but you do get a couple of sheets of instant transfer music symbols – designed by Mid-Sussex. A bit of a cop-out, I thought, although it's a perfectly practical solution I suppose. I usually add extras by hand.

After all this, you'll want to know what the finished product is like. Well, you can see for yourself. It's excellent – by far the best I have seen from a BBC program, and better than many available on other computers.

It uses the bit-image capability of the printer – rather than a screen dump as many other programs use – so the resolution is far better. It can, however, take several minutes to print a page. It supports most Epson-compatible printers or you can define your own driver if you have a different type.

The program could do with some tidying up in the presentation department as it really doesn't come across as a professional product. The menu screen, for example, is a simple black and white capital letters affair, and the whole screen scrolls after an incorrect entry. File handling and error detection could be improved, too – I did manage to crash it a couple of times.

The choice of keys and the implementation of some aspects of the program are inconsistent. Others seemed rather odd, too, although a little use does breed familiarity.

A little more attention to these details and to the presentation, plus a better key response – a few bytes of machine code perhaps – would considerably improve the program. Although many changes would be cosmetic, they would improve the feel, and that in a utility I believe is very important.

Having said all that, a little use will serve to acquaint you with its controls and it's not really difficult at all to master. If you can accept its limitations, at the end of it all you do get rather splendid results.

Mid-Sussex has used the system to produce many pieces of music for education and quite impressive they are, too. In spite of any reservations, if you like the quality of the output the Music Processor can be recommended.

Product: Music Processor, Version Two
Price: £49.95
Supplier: Mid-Sussex Software, 11 Bridle Way, Pound Hill, Crawley, West Sussex, RH10 4HP.
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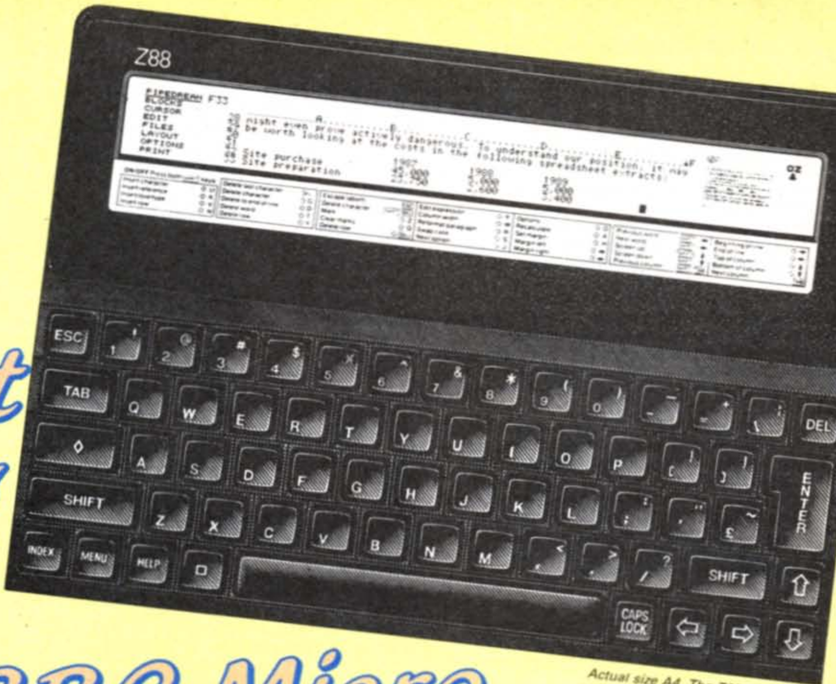

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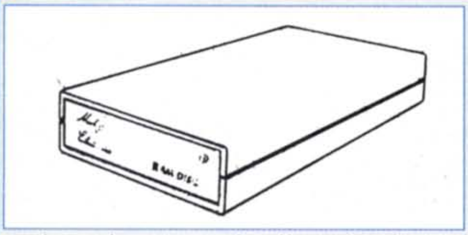

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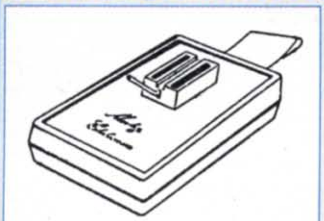

The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.

This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

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THE SOFTWARE

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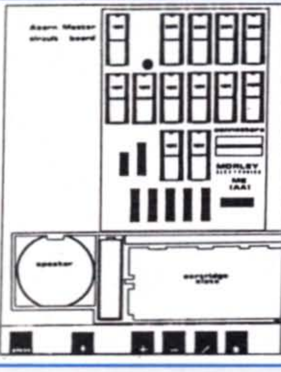

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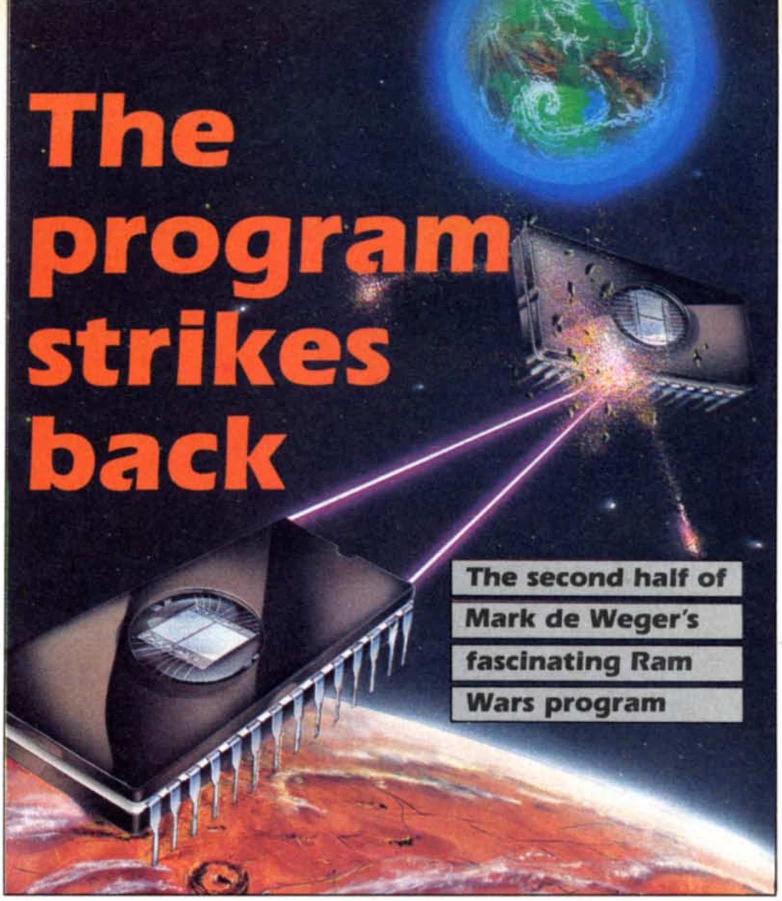
The program strikes back

The second half of Mark de Weger's fascinating Ram Wars program



LAST month we looked at how to write the Ram Wars battle programs and included the compiler to convert them into Redcode.

This time we present Mars – the Memory Array Redcode Simulator – that will run them. Two battle programs are loaded into Mars, which then runs one instruction alternately from each until either 2000 instructions have been executed or one of the programs crashes due to the aggressive action of the other.

Type in Mars and, after using Get it right! to ensure you've made no typing errors, save it. Prepare two battle programs using the compiler – or for testing purposes you can use two Imps as described last month.

Run Mars and follow the prompts: You can load the same file twice and watch the program run – the display should be as shown in Figure I.

The instructions being executed are shown in the two windows on the left, and on the right is a display of the ram. The plus and asterisk symbols represent the positions of the two programs and arrows show where store commands are being executed.

The turn count is displayed in the top right of the screen and, as the programs run, this increases quite rapidly – the Mars program runs at 60 ips (instructions per second).

Now let's look at a few more battle programs. The stupid memory-walking programs like Imp are first generation: Dwarf, shown in Program I and described in detail last month, can be considered one of the second generation programs – and these are still stupid.

Third generation programs have more intelligence: They either try to find their opponent, or can recognise trouble and move out of the way. Booby is a program of the former type.

Program II shows the code for Booby. First it pokes ones into two places 100 locations behind it and in front of it. Then, in line 40, it checks that the first place still contains a one. If a memory-walking program like Imp has passed this way the one will have changed to something else – this is detected and Booby then goes into an endless loop dropping zero bombs at location –50.

If the location behind is unchanged then the one ahead is checked, and if it has been changed a location 50 ahead is repeatedly bombed. So Booby is protected from fast-moving programs approaching from in front or behind, but is still useless against static programs like Dwarf.

Program III demonstrates a self-relocating program called Hopper. This simply copies itself 50 locations ahead each time, then jumps to the new copy: If it happens to copy itself on to the other program, the other is likely to crash before Hopper transfers control.

Pyramus, shown in Program IV, is like Hopper but smaller and more efficient. Because it's smaller it is harder to hit with bombs, and the distance it moves itself decreases each time. First it jumps 60 places then 59, 58 and so on, making it less predictable and again more secure.

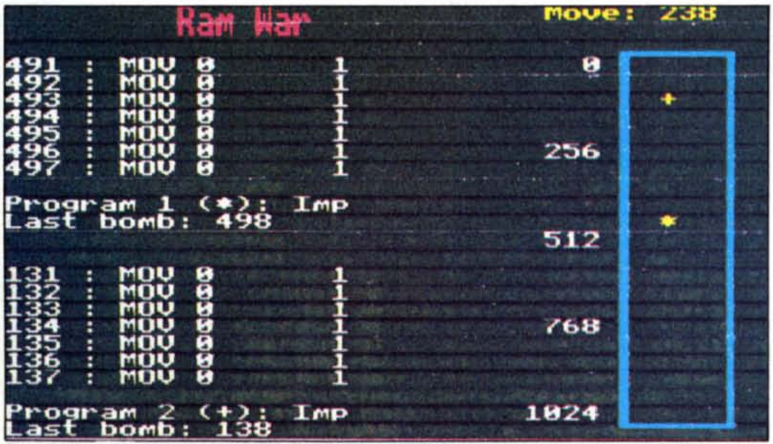
Program V, Slider, is another self-copying routine but is not too efficient. As you can see it copies itself 12 locations ahead, bombs three locations behind and then slides into the new copy of itself.

The Monkey, Program VI, can be described as a Turbo-Dwarf. The only apparent difference is that it throws bombs every eight locations instead of every five. This has important implications: If Dwarf misses the other program on its first circuit of the memory, it circles round and bombs itself. But by increasing the step value Monkey avoids this problem.

None of these programs is particularly intelligent, but now we come to Bat – Program VII. This works by keeping a picket of nine locations filled with ones 280 locations behind itself. It keeps checking these until a value is changed, then copies itself to the other side of the picket and transfers control.

This program works very well against both static/aggressive programs like Dwarf and Monkey, and also the fast-moving ones like Hopper and Imp.

To test out the efficiency of these programs you can set up a league-style



```
                 Ram War                     Move: 238
491 : MOV 0        1                  0
492 : MOV 0        1
493 : MOV 0        1                        +
494 : MOV 0        1
495 : MOV 0        1
496 : MOV 0        1                256
497 : MOV 0        1

Program 1 (*): Imp
Last bomb: 498                              *
                                    512

131 : MOV 0        1
132 : MOV 0        1
133 : MOV 0        1
134 : MOV 0        1                768
135 : MOV 0        1
136 : MOV 0        1
137 : MOV 0        1

Program 2 (+): Imp                 1024
Last bomb: 138
```

Figure I: Mars main screen

```
10 REM Dwarf
20 .loop
30 ADD #5 target
40 MOV #0 (target)
50 JMP loop
60 .target
70 DAT #-4
80 END
```

Program I

```
 10 REM Booby
 20 mine=100
 30 target=50
 40 MOV #1 mine
 50 MOV #1 -mine
 60 .main_loop
 70 CMP mine #1
 80 JMP over
 90 .bomb_loop1
100 MOV #0 target
110 JMP bomb_loop1
120 .over
130 CMP -mine #1
140 JMP main_loop
150 .bomb_loop2
160 MOV #0 -target
170 JMP bomb_loop2
180 END
```

Program II

```
 10 REM Hopper
 20 clone = 50
 30 .loop
 40 MOV (from) (to)
 50 ADD #1 from
 60 ADD #1 to
 70 CMP from #0
 80 JMP over
 90 JMP loop
100 .over
110 MOV #-9 clone+from-loop
120 MOV #40 clone+to-loop
130 JMP clone
140 .from
150 DAT #-9
160 .to
170 DAT #40
180 END
```

Program III

```
 10 REM Pyramus
 20 .loop
 30 MOV (from) (to)
 40 SUB #1 from
 50 CMP from #-8
 60 JMP (to)
 70 SUB #1 to
 80 JMP loop
 90 .to
100 DAT #61
110 .from
120 DAT #0
130 END
```

Program IV

```
 10 REM Slider
 20 first_bomb=-21
 30 MOV #2 end
 40 MOV #-11 end+1
 50 .loop
 60 MOV #0 first_bomb
 70 MOV #0 first_bomb-23
 80 MOV #0 first_bomb-46
 90 MOV (6) (5)
100 ADD #1 end
110 ADD #1 end+1
120 JMZ  end+1 end+2
130 JMP loop
140 .end
150 END
```

Program V

```
10 REM Monkey
20 .loop
30 ADD #8 target
40 MOV #0 (target)
50 JMP loop
60 .target
70 DAT #-7
80 END
```

Program VI

```
 10 REM Bat
 20 from=start-1
 30 to=start-2
 40 .start
 50 MOV #-280 to
 60 .bar_loop
 70 MOV #1 (to)
 80 SUB #1 to
 90 CMP to #-289
100 JMP check_start
110 JMP bar_loop
120 .check_start
130 MOV #-279 to
140 .check_loop
150 CMP to #-288
160 JMP check_start
170 SUB #1 to
180 CMP (to) #1
190 JMP check_loop
200 MOV #-290 to
210 MOV #18 from
220 .copy_loop
230 SUB #1 to
240 MOV (from) (to)
250 DJZ from to-290-18
260 JMP copy_loop
270 END
```

Program VII

competition. Each is run five times against every other, the winner getting four points and the loser zero. If there is a draw the larger program gets three points and the loser one, and where both are the same size they each score two points.

Table I shows the results of the competition. As you can see, the most intelligent program – Bat – comes out on top with Monkey a close second. Close analysis of the results shows interesting but predictable results.

Booby doesn't do too well: This is to be expected as it was really only designed to attack stupid memory walkers like Imp and Slider: It has no chance against aggressive programs like Monkey, or even simple Hopper-types.

Dwarf does quite well against the slow and static programs, but not against fast ones – watching Hopper being chased by Dwarf's bombs is quite fun. Will Hopper reach Dwarf before Dwarf's bombs hit Hopper?

Hopper itself scores highly against Pyramus, because as Pyramus slows down Hopper continues to zoom through memory and is very likely to land on its opponent during one of its circuits of memory.

Imp fairs badly since most of its fights lead to a draw and it only gets one point, being the smallest. It scores almost nothing against Booby since this is exactly the type of program Booby is designed to kill.

Slider is quite effective against the faster-moving programs because it bombs behind every now and again, but against static programs it doesn't stand a chance because it moves so slowly.

Monkey does very well against this field of programs – except Dwarf. This is quite surprising as Monkey is a souped-up version of Dwarf. The reason is simply that since Dwarf bombs at a higher density than Monkey, it's more likely to hit. Finally, we have Bat which comes out on top because it behaves intelligently in the face of adversaries.

Well, that's it on our side of the paper. Now it's over to you. There are infinite possibilities for creating programs of increasing intelligence and complexity. We've provided you with these samples to get you going – there are ones we didn't show you. These include Zombie which forces Dwarf to commit suicide, and Guerilla which pops up at a random place, bombs a few locations and then disappears.

But no matter how good your programs are there are always others that can beat them. That's the never-ending story of Ram Wars.

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	Booby	Dwarf	Hopper	Imp	Pyramus	Slider	Monkey	Bat	Total	Rank
Booby	XX	8	6	18	7	16	0	3	58	6
Dwarf	12	XX	12	17	0	20	16	0	77	3
Hopper	14	8	XX	15	16	8	1	7	69	5
Imp	2	3	5	XX	5	4	5	5	29	8
Pyramus	13	20	4	15	XX	8	4	10	74	4
Slider	4	0	12	16	12	XX	0	1	45	7
Monkey	20	4	19	15	16	20	XX	6	100	2
Bat	15	20	13	15	10	19	14	XX	106	1

Table I: Competition results

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```
   10 REM Mars: M-code Interpreter
   20 REM     by Mark de Weger
   30 REM (c) The Micro User
   40 REM ========================
   50 MODE 7
   60 DIM code 1300,sbuf1 6,sbuf2 24
   70 DIM sblock 8,p%(2,50),f$(2)
   80 DIM s%(2),i%(2):PROCinit
   90 DIM mem maxmem*4+4:PROCassemble
  100 ON ERROR MODE7:PROCerror
  110 sound=FNyes("Do you wish sound")
  120 IF sound THEN *FX210
  130 REPEAT CLS
  140 PRINT"Mars: M-code interpreter"
  150 PRINTSTRING$(23,"=")
  160 PRINT'"Executes Ram War programs c
ompiled by"
  170 PRINT"the Redcode compiler into M-
code."'
  180 IF askload load=FNyes("Load new ba
ttle programs")
  190 IF load PROCload_progs
  200 PROCpoke_progs:PROCscreen
  210 ?incr=0:incr?1=0
  220 ?bxb=15:?stat=0:CALL repeat
  230 PRINTTAB(0,0)o$'o$:*FX21
  240 REPEAT UNTIL GET=32:CLS
  250 nmoves=!incr AND &FFFF
  260 IF nmoves<>(!minc AND &FFFF) IF ?b
pro<>3 PRINT'"Program ";2-?bpro;" has wo
n after ";nmoves;" moves." ELSE PRINT'"I
t is a draw.":IF short<2 PRINT"Program "
;1+short;" is declared the winner."
  270 PROCask:UNTIL FALSE
  280 DEF PROCinit:*FX210,1
  290 maxmem=1024:maxmoves=2000
  300 close=.33:c1$="*":c2$="+":of=&C00
  310 bins=&70:btyp=of+4:bmoa=of+8
  320 bmob=of+12:bfia=of+16:bfib=of+20
  330 bmem=&72:bind=of+32:btem=&74
  340 opra=&76:oprb=&7A:adra=of+24
  350 adrb=of+28:tind=of+40:ind1=&7E
  360 ind2=&80:bpro=&82:bcar=&83
  370 incr=of+56:minc=of+60:bnum=&84
  380 bws=&86:bxb=&88:stat=&89
  390 oswrch=&FFEE:osbyte=&FFF4
  400 osword=&FFF1:CLOSE#0:@%=&904
  410 VDU23;8202;0;0;0;
  420 $sbuf1="#"+CHR$0+"(   )"
  430 $sbuf2="DATMOVADDSUBJMPJMZDJZCMP"
  440 xb=5:cl$=CHR$150:sl$=CHR$131
  450 o$=CHR$141+CHR$130+"Game over. Pre
ss space"
  460 askload=FALSE:load=TRUE
  470 !sblock=&FFF80000:sblock!4=&10005
  480 ?minc=maxmoves MOD 256
  490 minc?1=maxmoves DIV 256
  500 FOR I%=of TO of+50STEP4:!I%=0:NEXT
  510 Z%=RND(-TIME):ENDPROC
  520 DEF PROCload_progs
  530 INPUT'"Enter filename 1: X."f$(1)
  540 INPUT"Enter filename 2: X."f$(2)
  550 FOR L%=1 TO 2:s%(L%)=0
  560 I%=OPENIN("X."+f$(L%))
  570 REPEAT s%(L%)=s%(L%)+1
  580 INPUT#I%,p%(L%,s%(L%))
  590 UNTIL EOF#I%:CLOSE#I%
  600 f$=LEFT$(f$(L%),1)
  610 C%=1:REPEAT C%=C%+1
  620 f$=f$+CHR$(ASCMID$(f$(L%),C%)OR32)
  630 UNTIL C%=LENf$(L%):f$(L%)=f$:NEXT
  640 IF s%(2)<s%(1) short=0 ELSEIF s%(1
)<s%(2) short=1 ELSE short=2
  650 askload=TRUE:ENDPROC
  660 DEF PROCpoke_progs
  670 !bins=mem:CALL clear_mem
  680 i%(1)=RND(maxmem-1)*4
  690 REPEAT i%(2)=RND(maxmem-1)*4
  700 dum=ABS(i%(1)-i%(2))/4
  710 UNTIL dum>maxmem*close AND dum<max
mem*(1-close)
  720 FOR L%=1 TO 2:I%=i%(L%)
  730 size=0:REPEAT size=size+1
  740 mem!I%=p%(L%,size)
  750 I%=(I%+4) MOD (maxmem*4)
  760 UNTIL size=s%(L%):NEXT
  770 !bmem=mem:!ind1=i%(1)
  780 !ind2=i%(2):ENDPROC
  790 DEF PROCscreen:CLS
  800 PRINTTAB(31,2)cl$"pppppp";
  810 PRINTTAB(31,24)cl$"££££££";
  820 FOR L%=3 TO 23
  830 PRINTTAB(31,L%)cl$"5"sl$SPC2cl$"j"
;
  840 NEXT
  850 PRINTTAB(24,3),0TAB(27,8),maxmem/4
TAB(27,13),maxmem/2TAB(27,18),maxmem*.75
TAB(27,23),maxmem
  860 PRINTTAB(0,11)"Program 1 (*): "f$(
1)'"Last bomb:";
  870 PRINTTAB(0,23)"Program 2 (+): "f$(
2)'"Last bomb:";
  880 a$=CHR$141+CHR$133+"Ram War"
  890 PRINTTAB(7,0)a$TAB(7,1)a$
  900 PRINTTAB(26,0)CHR$140CHR$131"Move:
"
  910 ENDPROC
  920 DEF PROCask:PRINT'
  930 IF FNyes("Another battle") ENDPROC
  940 IF FNyes("Chain Redcode compiler")
 CHAIN"Redcomp"
  950 END
  960 DEF FNyes(t$):PRINT't$"? ";:*FX15
  970 t$=CHR$(GETAND&5F):PRINTt$:=t$="Y"
  980 DEF PROCerror:VDU 26:CLOSE#0
  990 IF ERR=17 CLS:PROCask:ENDPROC
 1000 REPORT:PRINT" at ";ERL:END
 1010 DEF PROCassemble
 1020 PRINT'"Assembling code..."
 1030 FOR opt=0 TO 2 STEP 2
 1040 P%=code:[OPT opt
 1050 .clear_mem:LDX #maxmem/64
 1060 .l3:LDA #0:TAY
 1070 .l4:STA (bins),Y:INY:BNE l4
 1080  INC bins+1:DEX:BNE l3:RTS
 1090 .bepmo:CLC:LDA bmem:ADC bind
 1100  STA bins:LDA bmem+1:ADC bind+1
 1110  STA bins+1:LDY #3:LDA (bins),Y
 1120  PHA:AND #&F0
 1130 .l1:LSR A:DEY:BPL l1:STA btyp
 1140  PLA:PHA:AND #&C:LSR A:LSR A
 1150  STA bmoa:PLA:AND #3:STA bmob
 1160  LDY #0:LDA (bins),Y:STA bfib:INY
 1170  LDA (bins),Y:PHA:AND #&F
 1180  STA bfib+1:PLA:AND #&F0:STA bfia
 1190  INY:LDA (bins),Y:INY
 1200 .l2:LSR A:ROR bfia:DEY:BPL l2
 1210  STA bfia+1:LDA bmob:PHA:LDA bfib
 1220  PHA:LDA bfib+1:PHA:LDA bmoa
 1230  STA bmob:LDA bfia:STA bfib
 1240  LDA bfia+1:STA bfib+1
 1250  JSR det:LDX #3
 1260 .l5:LDA oprb,X:STA opra,X:DEX
 1270  BPL l5:LDA adrb:STA adra
 1280  LDA adrb+1:STA adra+1:PLA
 1290  STA bfib+1:PLA:STA bfib:PLA
 1300  STA bmob:JSR det:JMP acti
 1310 .det:LDA #0:LDX #3
 1320 .l6:STA oprb,X:DEX:BPL l6:LDA bmob
 1330  BEQ mo0:CMP #1:BEQ mo1:JSR calc
 1340  CLC:LDA adrb:ADC bmem:STA bins
 1350  LDA adrb+1:ADC bmem+1:STA bins+1
 1360  LDY #0:LDA (bins),Y:STA oprb:INY
 1370  LDA (bins),Y:STA oprb+1:ASL oprb
 1380  ROL oprb+1:ASL oprb:ROL oprb+1
 1390  CLC:LDA adrb:ADC oprb:STA adrb
 1400  LDA adrb+1:ADC oprb+1
 1410 .che1:CMP #(4*maxmem)/256:BCC ovm2
 1420  SBC #(4*maxmem)/256:JMP che1
 1430 .ovm2:STA adrb+1:JMP calc2:RTS
 1440 .mo0:LDA bfib:STA oprb:LDA bfib+1
 1450  STA oprb+1:RTS
 1460 .mo1:JSR calc
 1470 .calc2:CLC:LDA adrb:ADC bmem
 1480  STA bins:LDA adrb+1:ADC bmem+1
 1490  STA bins+1:LDY #3
 1500 .l7:LDA (bins),Y:STA oprb,Y:DEY
 1510  BPL l7:RTS
 1520 .calc:LDA bfib:STA adrb:LDA bfib+1
 1530  ASL adrb:ROL A:ASL adrb:ROL A
 1540  STA adrb+1:CLC:LDA adrb:ADC bind
 1550  STA adrb:LDA adrb+1:ADC bind+1
 1560 .che2:CMP #(maxmem*4)/256:BCC ovmo
 1570  SBC #(maxmem*4)/256:JMP che2
 1580 .ovmo:STA adrb+1:RTS
 1590 .ind4:LDA bind:CLC:ADC #4:STA bind
 1600  LDA bind+1:ADC #0
 1610 .ind5:CMP #maxmem/64:BCC to2
 1620  SBC #maxmem/64:JMP ind5
 1630 .to2:STA bind+1:.ret:RTS
 1640 .acti:CLC:LDA adrb:ADC bmem
 1650  STA bins:LDA adrb+1:ADC bmem+1
 1660  STA bins+1:LDA btyp:BEQ ret
 1670  CMP #1:BEQ t1:CMP #2:BEQ t2
 1680  CMP #3:BEQ t3:CMP #4:BEQ t4
 1690  CMP #5:BEQ t5:CMP #6:BEQ t6
 1700  CMP #7:BNE t7o:JMP t7
 1710 .t7o:LDA #0:STA btyp:BEQ ret
 1720 .t1:LDY #3
 1730 .tl1:LDA opra,Y:STA (bins),Y
 1740  DEY:BPL tl1:JMP ind4
 1750 .t2:CLC:LDA opra:ADC oprb
 1760  STA btem:LDA opra+1:ADC oprb+1
 1770 .che3:CMP #maxmem/256:BCC to1
 1780  SBC #maxmem/256:JMP che3
 1790 .to1:STA btem+1:LDY #0:LDA btem
 1800  STA (bins),Y:INY:LDA btem,Y
 1810  STA (bins),Y:LDA #0:INY
 1820  STA (bins),Y:INY:STA (bins),Y
 1830  JMP ind4
 1840 .t3:SEC:LDA oprb:SBC opra:STA btem
 1850  LDA oprb+1:SBC opra+1:BCS to3
 1860  ADC #maxmem/256
 1870 .to3:JMP to1
 1880 .t4:LDA adrb:STA bind:LDA adrb+1
 1890  JMP ind5
 1900 .t5:LDA opra:BNE to4:LDA opra+1
 1910  BNE to4:BEQ t4
 1920 .to4:JMP ind4
 1930 .t6:CLC:LDA adra:ADC bmem:STA bins
 1940  LDA adra+1:ADC bmem+1:STA bins+1
 1950  SEC:LDA opra:SBC #1:STA btem
 1960  LDA opra+1:SBC #0:BCS to5
 1970  ADC #maxmem/256
 1980 .to5:STA btem+1:LDY #0:LDA btem
 1990  STA (bins),Y:INY:LDA btem,Y
 2000  STA (bins),Y:LDA #0:INY
 2010  STA (bins),Y:INY:STA (bins),Y
 2020  LDA btem:BNE to6:LDA btem+1
 2030  BNE to6:BEQ t4
 2040 .to6:JMP ind4
```

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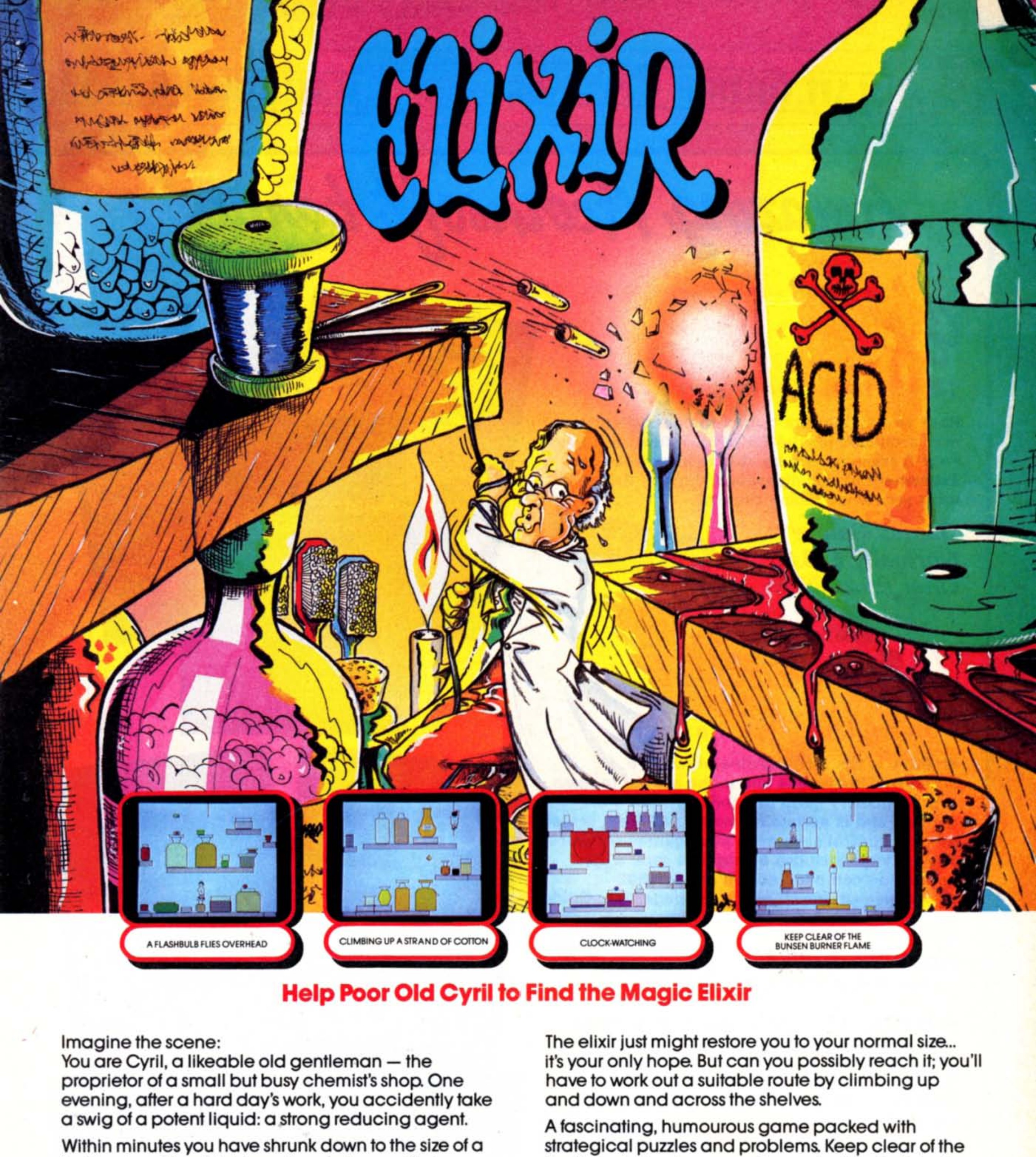
```
2050 .t7:LDY #3
2060 .tlu:LDA opra,Y:CMP oprb,Y
2070  BNE tne:DEY:BPL tlu:BMI to6
2080 .tne:CLC:LDA bind:ADC #4:STA bind
2090  LDA bind+1:ADC #0:STA bind+1
2100 .to6:JMP ind4
2110 .repout2:LDA #3:STA bpro
2120  LDA #&7E:JMP osbyte
2130 .repeat:LDA &FF:AND #&80
2140  BNE repout2:LDA #&79:LDX #&E2
2150  JSR osbyte:CPX #&E2:BNE nspc
2160 .wspc:JSR osbyte:CPX #&E2:BEQ wspc
2170  LDA stat:EOR #&FF:STA stat
2180 .nspc:LDA stat:BNE repeat:LDA ind1
2190  STA bind:STA tind:LDA ind1+1
2200  STA bind+1:STA tind+1:LDA #0
2210  STA bpro:LDA #ASC(c1$):STA bcar
2220  JSR exe:LDA bind:STA ind1
2230  LDA bind+1:STA ind1+1:LDA btyp
2240  BEQ repout:LDA ind2:STA bind
2250  STA tind:LDA ind2+1:STA bind+1
2260  STA tind+1:LDA #1:STA bpro
2270  LDA #ASC(c2$):STA bcar:JSR exe
2280  LDA bind:STA ind2:LDA bind+1
2290  STA ind2+1:LDA btyp:BEQ repout
2300  INC incr:BNE ro1:INC incr+1
2310 .ro1:LDX #34:LDY #0:JSR tab
2320  LDA incr:STA bnum:LDA incr+1
2330  STA bnum+1:JSR decout:LDA incr
2340  CMP minc:BNE repeat2:LDA incr+1
2350  CMP minc+1:BNE repeat2
2360 .repout:RTS
2370 .repeat2:JMP repeat
2380 .exe:JSR bepmo:LDA #28:JSR oswrch
2390  LDA #0:JSR oswrch:LDA bpro
2400  BNE ro2:LDA #10:JSR oswrch
2410  LDA #25:JSR oswrch:LDA #3
2420  JSR oswrch:BNE ro3
2430 .ro2:LDA #22:JSR oswrch:LDA #25
2440  JSR oswrch:LDA #15:JSR oswrch
2450 .ro3:LDX #0:LDY #7:JSR tab
2460  LDA tind:STA bnum:LDA tind+1
2470  STA bnum+1:LSR bnum+1:ROR bnum
2480  LSR bnum+1:ROR bnum:JSR decout
2490  LDA #4:JSR tabx:LDA #ASC(":")
2500  JSR oswrch:JSR sp:LDA btyp
2510  CLC:ADC btyp:ADC btyp:TAY:LDX #3
2520 .exel1:LDA sbuf2,Y:JSR oswrch:INY
2530  DEX:BNE exel1:JSR sp:LDA btyp
2540  BEQ exeo1:CMP #4:BEQ exeo1
2550  JSR prifi:LDA #17:JSR tabx
2560 .exeo1:LDA bmob:STA bmoa:LDA bfib
2570  STA bfia:LDA bfib+1:STA bfia+1
2580  JSR prifi:LDA #10:JSR oswrch
2590  LDA #26:JSR oswrch:LDA btyp
2600  CMP #1:BNE not1:LDA #21
2610  LDX #4:LDY #0:JSR osbyte
2620  LDY bxb:LDX #35:JSR tab
2630  JSR sp:LDA #7:LDX #sblock MOD256
2640  LDY #sblock DIV256:JSR osword
2650  LDA adrb:STA btem:LDA adrb+1
2660  STA btem+1:LDX #35:JSR gpos
2670  STY bxb:LDA #ASC("["):JSR oswrch
2680  LDA bpro:BEQ gp2:LDA #12
2690 .gp2:CLC:ADC #12:TAY:LDX #11
2700  JSR tab:LDA adrb:STA bnum
2710  LDA adrb+1:STA bnum+1:LSR bnum+1
2720  ROR bnum:LSR bnum+1:ROR bnum
2730  JSR decout:JSR sp
2740  JSR oswrch:JSR oswrch
2750 .not1:LDA tind:STA btem:LDA tind+1
2760  STA btem+1:LDX #34:JSR gpos
2770  JSR sp:LDA bind:STA btem
2780  LDA bind+1:STA btem+1:JSR gpos
2790  LDA bcar:JMP oswrch
2800 .prifi:LDY bmoa:LDA sbuf1,Y
2810  JSR oswrch:LDA bfia+1
2820  CMP #maxmem/512:BCC klei
2830  LDA #ASC("-"):JSR oswrch:SEC
2840  LDA #maxmem MOD 256:SBC bfia
2850  STA bfia:LDA #maxmem DIV 256
2860  SBC bfia+1:STA bfia+1
2870 .klei:LDA bfia:STA bnum:LDA bfia+1
2880  STA bnum+1:TYA:PHA:JSR decout
2890  PLA:TAY:LDA sbuf1+3,Y:JMP oswrch
2900 .tab:LDA #31:JSR oswrch:TXA
2910  JSR oswrch:TYA:JMP oswrch
2920 .tabx:PHA:LDA #&86:JSR osbyte
2930  STX btem:PLA:SEC:SBC btem:TAX
2940  BEQ tabout:LDA #9
2950 .tabl:JSR oswrch:DEX:BNE tabl
2960 .tabout:RTS
2970 .sp:LDA #32:JMP oswrch
2980 .decout:LDA #255
2990 .vb:PHA:LDA #0:STA bws
3000  STA bws+1:LDX #16
3010 .volg:ASL bnum:ROL bnum+1:ROL bws
3020  ROL bws+1:LDA bws:SEC:SBC #10
3030  TAY:LDA bws+1:SBC #0:BCC geda
3040  INC bnum:STY bws:STA bws+1
3050 .geda:DEX:BNE volg:LDA bws
3060  LDY bnum:BNE vb:LDY bws+1:BNE vb
3070 .pri:ADC #48:JSR oswrch:PLA
3080  BPL pri:RTS
3090 .gpos:LDY #2
3100 .gp1:INY:SEC:LDA btem
3110  SBC #INT(maxmem/5) MOD 256
3120  STA btem:LDA btem+1
3130  SBC #INT(maxmem/5) DIV 256
3140  STA btem+1:BCS gp1:JMP tab
3150 ]:NEXT:ENDPROC
```

✓ Get it right!

```
  10 =    0 0 | 540 = FAE7 7 |1070 = F1EA 4
  20 =    0 0 | 550 = 9BED 9 |1080 = 4B26 D
  30 =    0 0 | 560 = A8EA 6 |1090 = 5251 D
  40 =    0 0 | 570 = 6493 D |1100 = D780 9
  50 = 1092 2 | 580 = 406A 7 |1110 = CFF9 5
  60 = 6395 0 | 590 = 8917 E |1120 = 5E33 C
  70 = D2E3 0 | 600 =  CDC 3 |1130 = FFBA D
  80 = F187 5 | 610 = BB31 F |1140 = 6390 4
  90 = 5205 3 | 620 = D818 2 |1150 = 9055 3
 100 =  5C8 B | 630 = 982C 8 |1160 = 6FA1 0
 110 =  6FF 1 | 640 = 8459 5 |1170 = 3E75 1
 120 = BCFF C | 650 = F9F8 7 |1180 = 7283 D
 130 = 7452 2 | 660 =  C3E 3 |1190 = 9F6E F
 140 = 7882 5 | 670 = B35A 9 |1200 = 2199 7
 150 = 28F6 9 | 680 = ED38 9 |1210 = 6A03 5
 160 = 9E94 3 | 690 = CF72 E |1220 = AF50 E
 170 = 6040 2 | 700 = 511C 8 |1230 = 480E D
 180 = 988F F | 710 = 9A42 5 |1240 = 5B89 E
 190 = CDB3 3 | 720 = 2CDC 5 |1250 = 5518 B
 200 = 30E0 9 | 730 = 6BB9 8 |1260 = 534E 4
 210 = FE8B 8 | 740 = B505 1 |1270 = AA33 5
 220 = D3DB 9 | 750 = 73BE 5 |1280 = 575A C
 230 = F68C C | 760 = 258C 0 |1290 = 6212 D
 240 = 2823 1 | 770 = 5346 5 |1300 = 306C 8
 250 = 9539 F | 780 = 80DD 0 |1310 = 5807 D
 260 = E060 9 | 790 = 4AC2 C |1320 = B588 7
 270 = D121 D | 800 = 452D C |1330 = 2FA6 1
 280 = ECD9 5 | 810 = 4B9A 3 |1340 = EBEB E
 290 = 7647 6 | 820 = 32A1 C |1350 = 1923 0
 300 = D182 4 | 830 = CC79 2 |1360 = 76BD 4
 310 = 47C6 D | 840 = 2C83 C |1370 = B27E 0
 320 = 3DD3 1 | 850 = EB4E C |1380 = 1C8A 1
 330 = DB35 8 | 860 = 41F4 5 |1390 = 3594 4
 340 = B78D 0 | 870 = 13F9 3 |1400 = 39EF 1
 350 = CDC6 6 | 880 = 4E4E 2 |1410 = 8EA9 6
 360 = A32F 4 | 890 = 66F3 7 |1420 = F25E B
 370 = 55B0 6 | 900 = E4B1 3 |1430 = CADF 2
 380 = 3E04 C | 910 = ED0F B |1440 = F61D B
 390 = 5C3E E | 920 =  185 A |1450 = 8B57 F
 400 = 36AE D | 930 = BF60 5 |1460 = 6966 F
 410 = F716 C | 940 =  980 6 |1470 = B8DC E
 420 = 9AB5 9 | 950 = FD2E 8 |1480 = FBFF 7
 430 = 65BA 3 | 960 = B026 D |1490 = 4028 6
 440 = 58D6 E | 970 = 9208 1 |1500 = BC61 3
 450 = CAF0 A | 980 = BA1D 2 |1510 = CAE6 F
 460 = EADC 4 | 990 = 4FE1 4 |1520 = 644B 7
 470 = 5D92 D |1000 =  532 3 |1530 = C864 0
 480 = 6D52 A |1010 = 98A5 B |1540 = 41B6 0
 490 = C333 D |1020 = 4A4E 9 |1550 = 3949 A
 500 = 1BDC C |1030 = 465E A |1560 = B48F 5
 510 = 269A B |1040 = 14D4 4 |1570 = 6862 6
 520 = 56CB F |1050 = 942E 3 |1580 = C6EB 9
 530 = 1E09 B |1060 = E855 A |1590 = 522A A
```

```
1600 =  DDD 2|2130 = 83B6 5|2660 = 33B6 2
1610 = E01B 3|2140 = AF26 4|2670 = 3554 9
1620 = D011 0|2150 = 2C32 C|2680 = 4D04 2
1630 = 1500 5|2160 =  DF7 9|2690 = F312 E
1640 = 21D7 5|2170 = B91D 8|2700 = DB0C 4
1650 = FBFF C|2180 = F886 2|2710 = F1EB D
1660 = 84BB E|2190 = 6D8E F|2720 =  4EA 3
1670 = CDF8 0|2200 = 3173 E|2730 = 8AC2 2
1680 = BB9C 0|2210 = 20C1 F|2740 = 8742 9
1690 = BEE2 3|2220 = E3B2 2|2750 = BCAF 0
1700 = 35C0 C|2230 = 3D33 7|2760 = 5CF3 6
1710 = 367E 9|2240 = 8AAA C|2770 = B7B4 1
1720 = 3093 2|2250 = 627F E|2780 = 18A1 8
1730 = 3171 2|2260 = B9E4 F|2790 = 8D78 7
1740 = F63D 1|2270 = 8891 3|2800 = 24D0 3
1750 = AD57 A|2280 = BC76 4|2810 = 6650 B
1760 = FF09 F|2290 = EC97 1|2820 = 3729 7
1770 = FD49 A|2300 = 95C6 9|2830 = 2D7B A
1780 = E1CC B|2310 = 2A7F 8|2840 = 376F 4
1790 = 1264 0|2320 = A2AC 3|2850 = F775 5
1800 = 8D73 4|2330 = 61E7 6|2860 = 5B57 0
1810 = 2826 6|2340 = 5E24 F|2870 = 790D 9
1820 = B7F7 E|2350 = 932E 0|2880 = DE46 C
1830 = B39C 1|2360 = B001 8|2890 = EB52 7
1840 = 544F E|2370 = EDB3 9|2900 = CF3E 4
1850 = 92EC 7|2380 = 45E3 F|2910 = 82DD B
1860 = 9C79 1|2390 = 32E5 E|2920 = 4E9D 5
1870 = 9680 4|2400 = 239E 3|2930 = 3CFA 6
1880 = 5F43 C|2410 = 4519 8|2940 = 7729 7
1890 = A3BD 3|2420 = CE82 A|2950 = 40E1 3
1900 = DAB3 6|2430 = 740D B|2960 = ED43 A
1910 = 6FDC D|2440 = 492A B|2970 = D127 0
1920 = ED09 3|2450 = C608 8|2980 = 8F15 A
1930 = 74AF C|2460 = B70E 8|2990 = 54DD F
1940 = D7FF F|2470 = 5073 1|3000 = A5CC 0
1950 = 50CF F|2480 = 6F89 3|3010 = 3ED8 D
1960 = 4F0D F|2490 = 2A5B E|3020 = 14E6 2
1970 = 9C79 3|2500 = 7624 4|3030 =  405 E
1980 = 8034 E|2510 = 8869 5|3040 = F3B4 3
1990 = 8D73 7|2520 = D241 E|3050 = 84CB 4
2000 = 2826 B|2530 = A47E A|3060 = A184 7
2010 = B7F7 B|2540 = AD67 C|3070 = 5DF8 D
2020 = 4017 9|2550 = 3808 5|3080 = B457 E
2030 = E07A 4|2560 = 1911 2|3090 = 68DD E
2040 = 3383 A|2570 = FA14 F|3100 = E964 6
2050 = B058 5|2580 = 4F74 F|3110 = A95A 9
2060 = ABF5 2|2590 = 5359 B|3120 = 46A3 8
2070 = BBA7 7|2600 = 133C 4|3130 = EDD9 6
2080 = 1224 8|2610 = 85A4 6|3140 = 285A 2
2090 = 61B2 9|2620 = 5287 F|3150 = 953B 6
2100 = 3383 0|2630 = DBAE B|
2110 = 3A47 3|2640 = D123 B|
2120 = 2A18 7|2650 = 2E9D 3|
```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CLOCK-WATCHING
KEEP CLEAR OF THE BUNSEN BURNER FLAME

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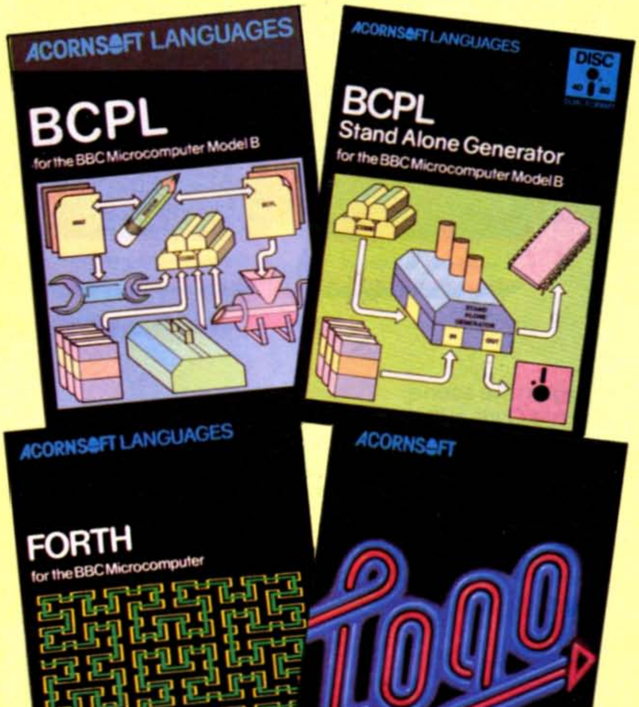
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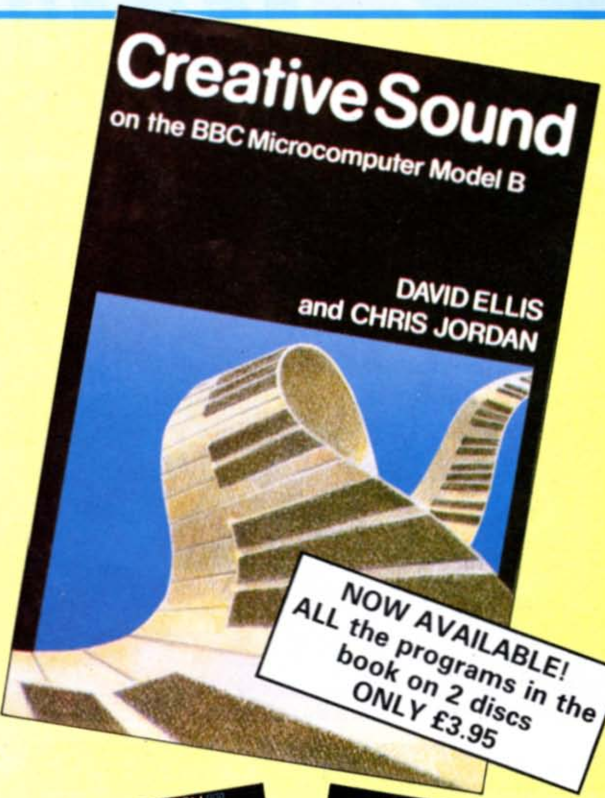
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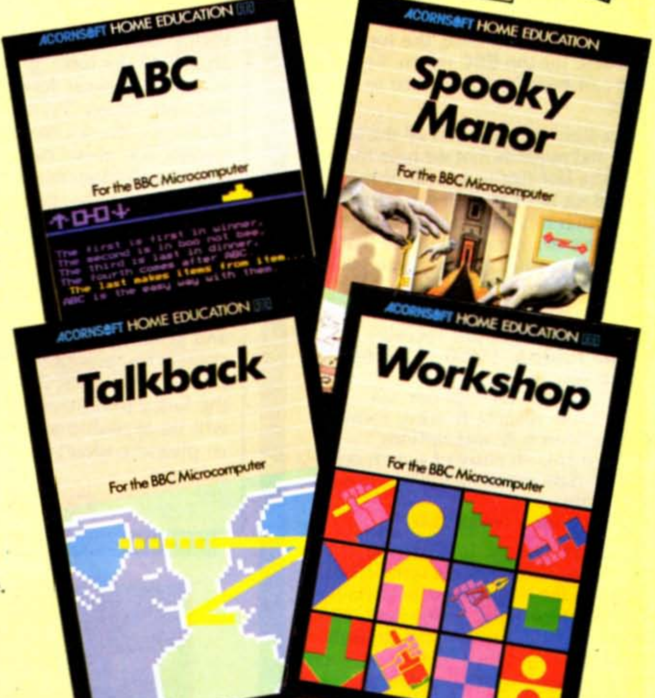
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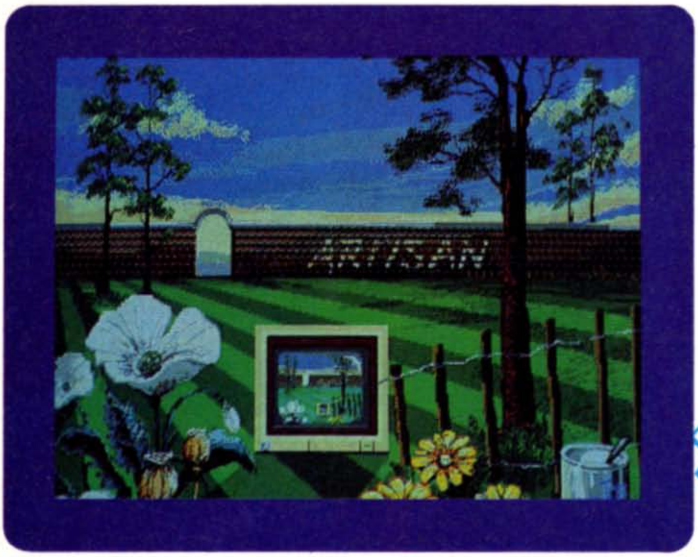

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Putting it on the line

Andy Smith tackles the latest Archimedes drawing package

DIAGRAM II is a drawing and design program that was produced in its original form as a package for the BBC 6502 range (B,B+,Master and Compact). It has now found its way on to the Archimedes as a program that runs under the 65Arthur emulator.

The package consists of a 40-page manual, one 3.5in ADFS disc, function key guide and a two-page supplement for Archimedes users.

Its main advantage over a standard drawing package is that it enables diagrams to be much larger than the size of the screen. For this purpose the screen is divided up into areas of 8*8 pixels which are referred to as user-defined characters (UDCs), many of which will contain the same information.

To save disc space the number of each UDC is stored rather than the screen pixel information.

Although the manual says initially "The size of the diagram is only limited by the amount of disc space", it later says – "you are limited to 1024 different combinations of 8*8 pixel blocks". It would appear from experimentation that the latter is the real limiting factor.

The program is mainly driven by menus which appear in the Archimedes simulated Mode 7, and by function keys when drawing in Mode 0. The Archimedes mouse is implemented as a replacement for the cursor, Escape and Return keys.

The diagram is regarded as a collection of screens, so that an overall design may be, for example, two screens wide and two screens high, giving an area four times the size of a normal Mode 0 screen. The size is decided when a new diagram is set up, but may be altered as you progress.

You enter drawing mode after deciding the number of the screen you want to edit. This is then loaded from disc and you can move around the total area of the diagram with mouse or cursor keys until you find the area you want to draw into.

The disc is accessed while the scrolling is in operation, and movement is a little jerky as the screen is moved one character at a time in the required direction.

The package offers the standard set of drawing facilities such as circles, triangles, rectangles, arcs, sectors, ellipses, text entry and flood filling of areas. You can also plot the current range of UDCs to the screen.

Although pixel-by-pixel editing is available, there is no zoom facility, which makes very detailed work a bit of a strain.

A useful feature is the ability to import text from an Ascii file and have it formatted to fit a designated area of the screen, but only the standard font is available.

There is a choice of foreground and background colours – limited to two colours from a palette of eight – selected within drawing mode and recorded with the diagram on disc.

A simple mistake made while choosing these colours resulted in black background and black foreground which I was unable to recover from – wouldn't it be better to disallow the same foreground and background colour? It is also possible to crash the program in certain places by pressing Escape.

Printing is well catered for, with the ability to produce clear printouts in differing sizes and orientations. Preferences can be saved to disc for subsequent use. But there is no time-out or Escape facility for the printer, so if you have any problems – like running out of paper – you have to reset the computer.

The program can only dump to Epson-compatible printers, but it is possible to add the routine for your own printer fairly easily.

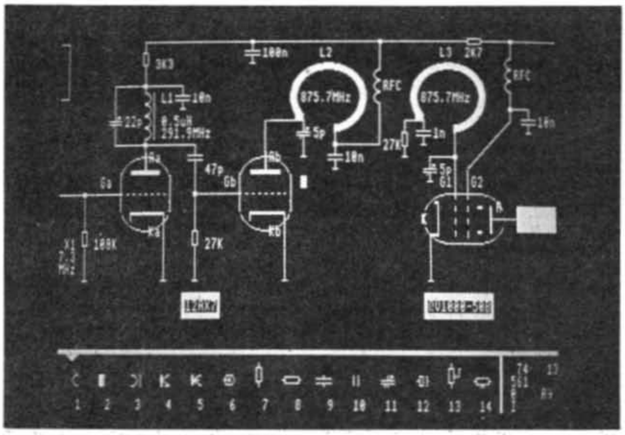
Unfortunately the manual has not been re-written for the Archimedes, and this may lead to some confusion. Phrases such as *non-standard DFS* and *Acorn GXR rom* serve to reinforce the fact that the Archimedes is far removed from a BBC B.

The last page in the manual shows a table from which you can derive important information regarding the facilities available within the program. Several combinations of hardware are shown – but not the Archimedes.

A two-page photocopied supplement is included with the package to help Archimedes users with loading the program, creating a disc for storing diagrams and using the Archimedes mouse. What a shame this package hasn't been improved to take advantage of the many other Archimedes enhancements .

The overall impression is of a hurried transfer to the new machine. This makes the price seem a little expensive in comparison to other art/drawing programs like Clares' Artisan, which runs on the native machine – not in 65Arthur – and only lacks the facility to produce pictures larger than one screen.

At a lower price this package could serve as a useful, if limited, introduction to design on computers.



The main drawing screen showing part of a much larger diagram

Product: Diagram II
Price: £55 (£63.25 with VAT)
Supplier: Pineapple Software, 39 Brownlea Gardens, Seven Kings, Ilford, Essex 1G3 9NL

THE MICRO USER PROGRAM Library No.12

Compiled by Chris Nixon

FOR the first time we have an ARM code macro for those people lucky enough to own an Archimedes. There's also a routine to rebuild the envelope parameters from what's in memory, and an excellent procedure to print numbers vertically for labelling graph axes.

Also included are: A shell for building your own interrupt-driven programs and a routine to tell you the type (Basic, text and so on) of any file on disc.

Send your routines – with full details of the language it is written in and the hardware/software requirements – on disc or tape to:

Library, The Micro User, Adlington Park, Adlington, Macclesfield SK10 5NP.

Remember to enclose a stamped addressed envelope for the return of your media. Five blank discs will be sent to the authors of any routines published.

Title: Register loader
Language: ARM
Author: Daniel Tang

Routines for the Archimedes are slowly trickling in, and this one is included despite its shortness because of what it achieves with such a small amount of code.

Anybody who is learning ARM assembly language after being used to good old 6502 will notice that you are not permitted to load 32 bit immediate constants directly into a register – only eight significant bits can be loaded at any one time.

This routine circumvents the problem by using a macro definition to assemble a short piece of code every time the macro's name is called from a program. Insert FNload(R,V) whenever you wish to use this facility, where *V* is the value to be loaded into register *R*.

The function works by clearing the register then loading the value one byte at a time. If any are zero the instruction is not assembled, ensuring that only vital instructions are generated. For example the code:

```
FNload(2,0)
```

will produce only one ARM code instruction when assembled:

```
MOV 2,#0
```

whereas:

```
FNload(5,&34000510)
```

would generate:

```
MOV 5,#0
ORR 5,#&10
ORR 5,#&0500
ORR 5,#&34000000
```

If conservation of space were a real problem in a big program, a cleverer macro could be worked out that would spot that the two commands to load &10 and &0500 could be combined to produce:

```
ORR 5,#&510
```

Remember with Basic V you can call function macros directly without OPT.

```
DEF FNload(R%,V%)
LOCAL L%,M%,O%:M%=&FF
[MOV R%,#0:]
FOR L%=0 TO 3
  M%=M%<<8
  O%=V% AND M%
  IF O%<>0 THEN [ORR R%,R%,#O%:]
NEXT:=""
```

Title: File peek
Language: Basic with DFS
Author: Stuart Ashley

File-handling programs will benefit from this routine, which is a function to help identify the type of any named file that has been saved on disc. If you have written a disc menu system, for instance, and would like to know whether the file being selected needs to be CHAINed or *RUN, this function will tell you. Any DFS which conforms to Acorn's recommendations will save tell-tale information in the catalogue and this can be interpreted, to a degree, as file-type identifiers.

The only exceptions are files saved from the View family, which seem to have random catalogue information. These will be confused with machine code by File Peek.

Use:

```
A%=FNfpeek(F$)
```

where *F$* holds the filename and *A%* is the variable in which to store the result. After the call *A%* will contain 0 if no file with that name was found, or 1, 2, 3, or 4 respectively if the file was Basic, a rom image, an exec/data file or machine code.

```
  10 REM File peek
  20 REM By Stuart Ashley
  30 INPUT"File to check",F$
  40 F%=FNfpeek(F$)
  50 IF F%=0 PRINT"No such
file!":END
   60 ON F% GOTO 70,80,90,100
   70 PRINT"BASIC program":END
   80 PRINT"ROM image":END
   90 PRINT"EXEC or DATA file":END
  100 PRINT"Machine code file":END
  110 DEF FNfpeek(A$)
  120 $&900=A$:!&A00=&900:A%=5
  130 X%=0:Y%=&A:A%=USR(&FFDD)AND&FF
  140 IF A%=0 =0
  150 IF ?&A07=&80 AND ?&A03<>&80 =1
  160 IF ?&A03=&80 =2
  170 IF !&A06=0 OR !&A06=&FFFFFFFF
=3
  180 =4
```

Get it right!

```
10 =    0 0 |  70 = 168E A | 130 = EF0A A
20 =    0 0 |  80 = 76A7 B | 140 = 5CF1 0
30 =  EDB B |  90 = AE02 5 | 150 = 2F07 B
40 = 42BE 9 | 100 = 5695 5 | 160 =   53 3
50 = 4D33 F | 110 = 5991 A | 170 = 4D18 1
60 = E761 A | 120 = 3964 4 | 180 =  51E 2
```

Title: VIA interrupts
Language: 6502 Machine Code
Author: Tony Nicholson

Using interrupts is notoriously fraught with problems of all kinds. Even the easy-to-use events can cause a headache, let alone the much more complex subject of the VIA timer chips.

This program allows you to implement your own code to run under interrupt control of the 6522 VIA.

The VIA counts pulses at 1MHz, which means it is capable of running your code one million times every second, unless you set the 16 bit variable *time* to a high number – the highest possible is 65535 which would cause 65535 ticks at 1MHz to elapse before the next interrupt, or 15 interrupts per second.

The lower the number you set *time* to, the faster the interrupts occur, until the poor old BBC Micro has no time to service its own operating system and crashes – so be careful.

To use the program, insert your own code between lines 230 and 260. You must make sure that your program executes before the next interrupt is due. Apart from that, there are no restrictions.

The example line 250 puts asterisks on the screen 15 times every second without affecting the running of the computer.

```
   10 REM VIA Interrupts
   20 REM by Tony Nicholson
   30 FOR L%=0 TO 3 STEP 3
   40 P%=&900:[OPT L%
   50 .setup
   60  LDA #255:LDX #55
   70  LDY #0:JSR &FFF4
   80  LDA &206:STA &232
   90  LDA &207:STA &233
  100  LDA #routine MOD256:STA &206
  110  LDA #routine DIV256:STA &207
  120  LDA #151:LDX reg6
  130  LDY time:JSR &FFF4
  140  LDA #151:LDX reg7
  150  LDY time+1:JSR &FFF4
  160  LDA #151:LDX reg11
  170  LDY #192:JSR &FFF4
  180  LDA #151:LDX reg14
  190  LDY #192:JSR &FFF4
  200  LDA #151:LDX reg5
  210  LDY time+1:JSR &FFF4:RTS
  220 .routine
  230  PHP:PHA:TXA:PHA:TYA:PHA
  240 \** Slot your routine here **
  250  LDA #42:JSR &FFEE
  260  LDA #150:LDX reg4:JSR &FFF4
  270  PLA:TAY:PLA:TAX
  280  PLA:PLP:JMP (&232)
  290 .time:OPT FNequw(65000)
  300 .reg4:OPT FNequb(&64)
  310 .reg5:OPT FNequb(&65)
  320 .reg6:OPT FNequb(&66)
  330 .reg7:OPT FNequb(&67)
  340 .reg11:OPT FNequb(&6B)
  350 .reg14:OPT FNequb(&6E)
  360 ]:NEXT:CALL&900:END
  370 DEF FNequb(N%):?P%=N%:P%=
P%+1:=L%
  380 DEF FNequw(N%):!P%=N%:P%=
P%+2:=L%
```

Get it right!

```
 10 =    0 0 | 140 = 3BB9 3 | 270 = 5549 A
 20 =    0 0 | 150 = 40CD F | 280 = B2E7 5
 30 = 10C9 9 | 160 = B2EC F | 290 = 49EE D
 40 = 7F14 5 | 170 = FDB4 1 | 300 =  E74 0
 50 = 2E9B 9 | 180 = E249 B | 310 = 9561 B
 60 = 5E5B C | 190 = FDB4 C | 320 = 287F E
 70 = AF64 5 | 200 = 1BFB 2 | 330 = B36A B
 80 = 9C3D 7 | 210 = D63B 0 | 340 = D9C5 F
 90 = E359 8 | 220 = 3C69 F | 350 = 68A4 E
100 =  C7D 8 | 230 = A5E9 2 | 360 = CF3A 2
110 = 969A 4 | 240 =    0 2 | 370 = 25E6 9
120 = 2B98 3 | 250 = BC56 7 | 380 = 631C 1
130 = F855 D | 260 = 55C8 2 |
```

Title: Envelope find
Language: Basic
Author: Dave Clarke

The lack of a built-in facility to display current ENVELOPE settings has been a cause of no small annoyance, but is now rectified by this utility.

Run the program, enter the number of the envelope you want, and it will be displayed with all parameters in a form perfect for editing back into a program.

The routine relies on the fact that the envelope storage area is always at &8C0, so compatibility is not guaranteed with all BBC Micros. However it will work on any BBC B, Master or Electron.

```
   10 REM Envelope Find
   20 REM Dave Clarke
   30 INPUT"Envelope number
(1-16)",N%
   40 N%=N%+1:@%=0:B%=&8C0
   50 PRINT"ENVELOPE ";N%+1;
   60 FOR L%=0 TO 12
   70 PRINT",";B%?(N%*16+L%);
   80 NEXT:PRINT:@%=10
```

Get it right!

```
10 =    0 0 | 50 = B4EF 4
20 =    0 0 | 60 = B933 1
30 = D854 4 | 70 = 6222 7
40 = 8171 B | 80 = ED13 9
```

Title: Vertical labeller
Language: 6502 / Basic
Author: Hilary Derbyshire

Writers of graph-generating programs will appreciate this routine, which turns a text string through 90 degrees anticlockwise for labelling the vertical axis of any graph or bar chart.

Indeed, its possibilities don't end there. Any screen display can be enhanced with careful thought, and this utility, because of its nature, will work in any graphics mode.

The routine – *vlabel* – is very simple to use, just call PROCvlabel("Message",X,Y) where *X* and *Y* are the horizontal and vertical pixel positions of where you would like the column to start.

The only thing you have to be careful of is that the routine sets then unsets the text to graphics cursor link with VDU4 and VDU5.

Each character in turn is sent to the machine code at &900, which uses osword 10 to read its definition before rotating and printing the result.

```
   10 REM  Vertical Labelling
   20 REM by Hilary Derbyshire
   30 MODE1:PROCassemble
   40 PROCvlabel("MESSAGE",600,700)
   50 END
   60 DEF PROCvlabel(L$,X%,Y%)
   70 VDU5:FOR N%=1 TO LEN(L$)
   80 ?&70=ASCMID$(L$,N%):CALL&900
   90VDU23,255,?&7C,?&7D,?&7E,?&7F,?&80
,?&81,?&82,?&83
  100 MOVE X%,Y%-32*(LEN(L$)N%):VDU255
  110 NEXT:VDU4:ENDPROC
  120 DEF PROCassemble
  130 FOR I%=0 TO 2 STEP 2
  140 P%=&900
  150 [OPT I%
  160  LDA #10:LDX #&70:LDY #0:JSR &FFF1
  170  LDA #1:STA &79:LDA #0:STA &7A
  180 .xloop LDX &7A:LDA #0
  190  STA &7C,X:LDY #1
  200 .loop1
  210  CLC:ASL&7C,X:LDA &79:AND &70,Y
  220 .loop2 CPX #0:BEQ cont
  230  CLC:LSR A:DEX:JMP loop2
  240 .cont LDX &7A
  250  CLC:ADC &7C,X:STA &7C,X
  260  INY:CPY#9:BNE loop1:CLC:ASL
&79
  270  INC &7A:LDX &7A:CPX #8:BNE
xloop
  280  LDY#0:RTS:]
  290 NEXT:ENDPROC
```

```
 10 =    0 0 | 110 = C10B 5 | 210 = 9E45 5
 20 =    0 0 | 120 = 98A5 D | 220 = F0B3 6
 30 =  B48 8 | 130 = A418 4 | 230 = F0FF A
 40 = 9A41 C | 140 = C92F E | 240 = 77E3 0
 50 = FD2E 3 | 150 = E106 6 | 250 = 913A 7
 60 = DABC F | 160 = 726D F | 260 = D532 9
 70 = 2835 1 | 170 = 3326 A | 270 = 900F 5
 80 = 2FBB A | 180 = 3F95 E | 280 = 6D35 C
 90 = 2297 5 | 190 = 5418 4 | 290 = E531 F
100 = C47C A | 200 = 3311 4 |
```

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Summary of Diagram II features:-

1. Works on all model BBC computers and makes use of Shadow memory if poss.
2. Rapid line drawing routines with automatic joins for circuit diagrams.
3. Rubber band line and circle drawing modes.
4. Makes use of the Acorn GXR rom to produce ellipses, arcs, sectors, chords and flood filling.
5. Pixel drawing mode allows very fine detail to be added.
6. Defined areas of screen may be moved, copied, deleted or saved to disc.
7. On-screen cursor position indication allows scale drawings to be made.
8. Keyboard keys may be defined to print User Defined Characters allowing new character sets to be used.
9. Wordprocessor files may be loaded and formatted into defined areas.
10. Up to 880 UDC's if shadow memory available, 381 without shadow.
11. Compatible with Marconi Trackerball and most makes of 'mouse'.
12. All 'Diagram Utilities' are included.
13. Completely 'scaleable print routines allow any area of the diagram to be printed either horizontally or through 90deg. in scales that may be varied in 1% steps allowing up to 18 mode 0 screens to be printed on an A4 sheet (still with readable text).
14. Smooth scrolling over the whole area of the diagram.

Diagram II consists of a set of disc files and a 16k Eprom. The disc is formatted 40T side0 and 80T side2. Please state if this is unsuitable for your system, or if you require a 3.5" Compact disc

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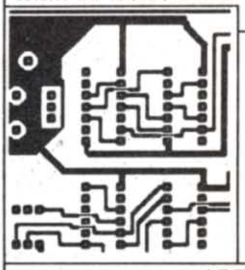

PCB Plotter Driver

A new addition to the PCB software is the PCB plotter driver program. This enables files produced by PCB to be used in conjunction with most types of plotter to produce plotted output rather than the normal dot-matrix printer output. The program is suitable for use with most makes of plotter including Hewlett Packard, Hitachi and Plotmate M. The program can also be configured to work with other plotters by entering suitable plotter instructions.

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Access

Get knitting on your micro with

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Now you can use your BBC Micro or Electron to design perfectly-fitting knitwear – then print out the complete pattern.

It's the biggest development since the home knitting machine – and it's so simple to use. Now anyone can use a computer to design knitwear to individual measurements and then produce row-by-row knitting instructions on the printer.

YOU CAN:

- Work with any yarn, from fine cottons to chunky wools
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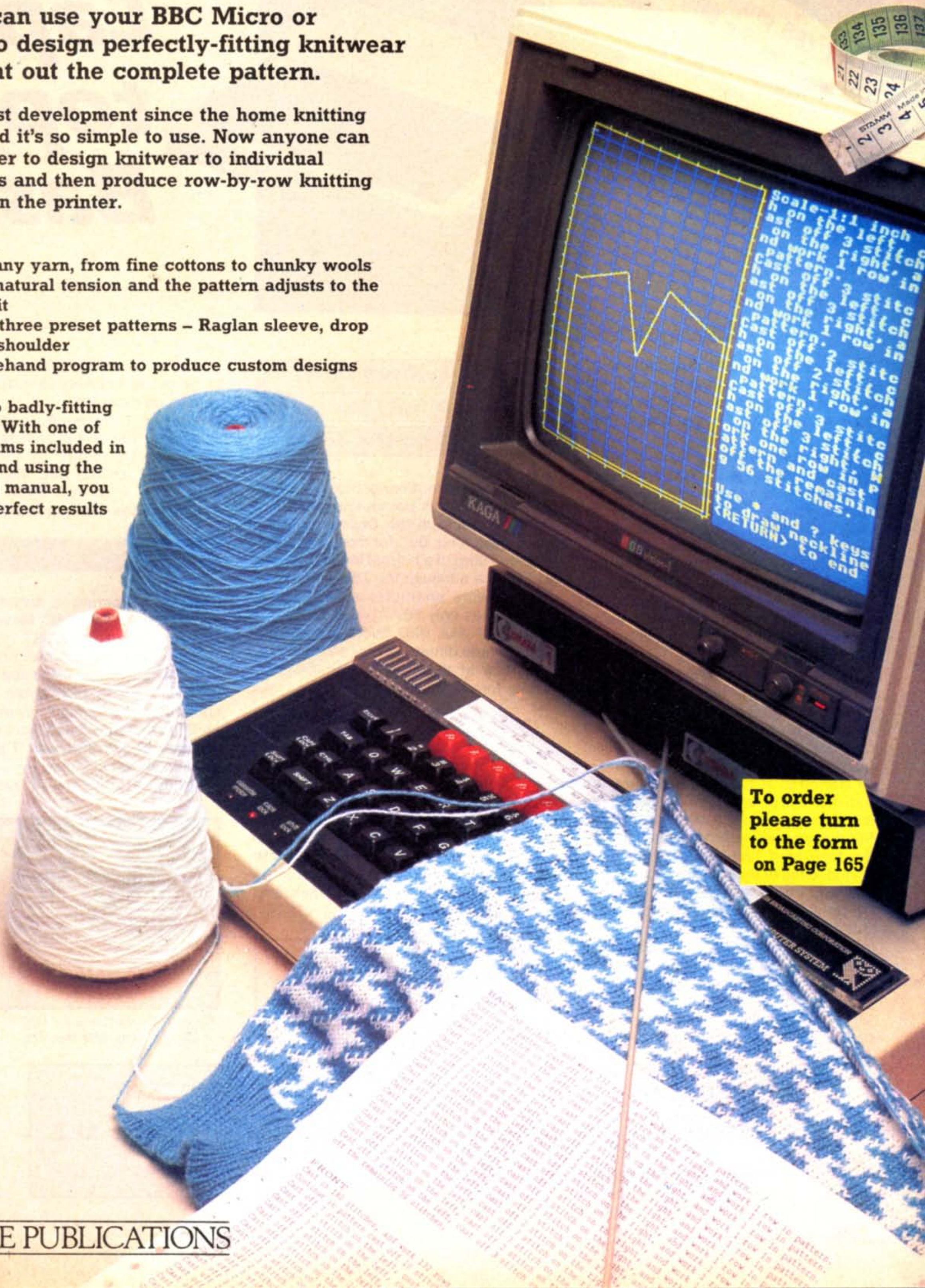
- Select from three preset patterns – Raglan sleeve, drop and square shoulder
- Use the Freehand program to produce custom designs

Say goodbye to badly-fitting home knitting. With one of the five programs included in the package, and using the clearly written manual, you can produce perfect results every time.



The program itself produces a plain knit, leaving you to use your own favourite stitch pattern, such as the Fair Isle design featured here.

To order please turn to the form on Page 165

£8.95
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Also available on disc for use on the Advanced Plus 4 and Slogger SEDFS.
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DATABASE PUBLICATIONS

All Z88 programs in The Micro User also work on the BBC Micro, with the addition of an extra line – given in the text – which simulates the Z88 liquid crystal display.

Lap top Basic

Peter Davidson takes a look at how to program on the Z88

I HAVE used the Z88 as a portable word processor and found it very useful. No longer are my pockets full of scraps of paper with scribbled notes after a train journey.

Now I don't have to spend hours typing-up my notes when I get home. All I do is type them into the Z88 during the journey, connect it to my BBC Micro when I get home and the document is there ready.

But what else can a Z88 do? Over the next few months we'll be looking at lots of uses and the best way to implement them. In many cases this means using the portable in conjunction with your BBC Micro.

My children enjoy playing on the Z88 – it's ideal for computing in bed while dad thinks they're asleep. However, they're becoming tired of typing stories now, so I decided to investigate the BBC Basic that comes with the Z88.

I started to adapt the Tables program from the December 1986 issue of *The Micro User* and key it straight into the Z88. I soon realised that was a mistake. The lack of a line editor of any sort reminded me of entering Basic programs into a primitive computer in the early 1970s – not at all what we're used to today.

So it was back to my trusty BBC Micro for entering and developing the program and then port it over to the Z88 once it was complete.

The first thing I needed was a Z88-sized screen on the BBC Micro so I could test the software. Connecting an LCD of the correct size is possible, as the Body Building article in the December 1987 issue described. But, for most purposes, a narrow strip of a normal Mode 0 screen will suffice although the Z88 screen has 92 available character spaces while Mode 0 has only 80.

To give your BBC Micro screen the approximate dimensions of a Z88 set up a window at the start of your program using, for example:

```
1 MODE0:COLOUR0:COLOUR129
:VDU28,0,18,79,11:CLS
```

Now enter your program in the usual way, avoiding commands not implemented on the Z88 – the sound, graphics and analogue ones. A full list was in the January issue of *The Micro User*.

Also, one or two don't behave in quite the same way as on the BBC Micro. Try the following on both machines and you'll see what I mean:

```
10 T=1
20 RESTORE T*1000
30 READ X
40 PRINT X
1000 DATA 1000
```

On the Z88 the T*1000 on line 20 has to be put in brackets to make the line behave as expected.

Another difference is the VDU7 command. The lack of real sound made me have to resort to beeps, but VDU7,7,7,7 on the BBC Micro gives a long beep – on the ZX88 it seems exactly the same length as a single one.

Transfer

Once your program is entered, tested and saved on your BBC Micro, how do you transfer it to the Z88?

First, you need a cable, and connections for a two-way cable are the same as the ZX88 to BBC Micro cable we showed in the January issue, with the addition that pins 8 and 9 are connected together at the Z88 end. The full diagram is shown in Figure I.

Although software is available to

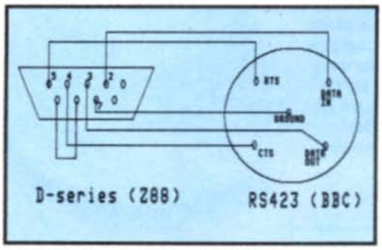
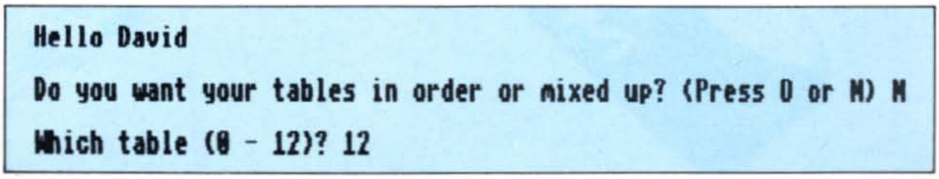
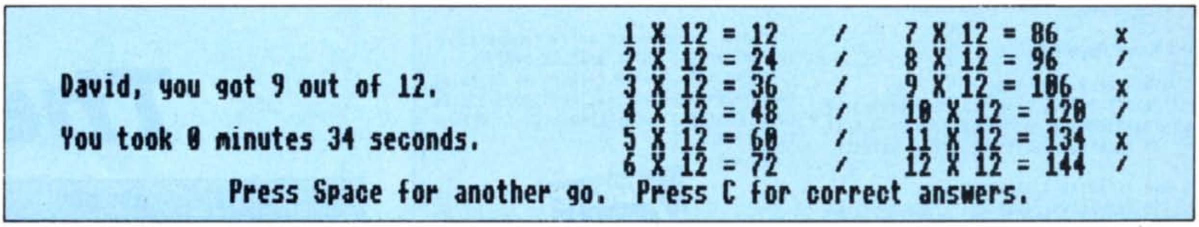


Figure I: Connections for BBC to Z88 two-way data transfer



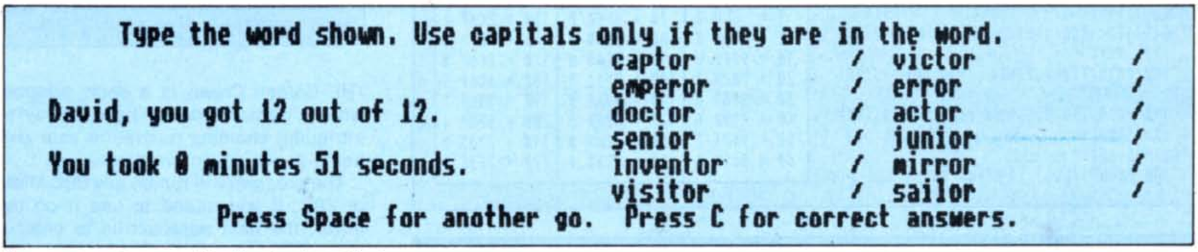
```
Hello David

Do you want your tables in order or mixed up? (Press O or M) M

Which table (0 - 12)? 12
```

The opening screen of the Z88 tables testing program



```
                                  1 X 12 = 12    /    7 X 12 = 86     x
                                  2 X 12 = 24    /    8 X 12 = 96     /
David, you got 9 out of 12.       3 X 12 = 36    /    9 X 12 = 106    x
                                  4 X 12 = 48    /    10 X 12 = 120   /
You took 0 minutes 34 seconds.    5 X 12 = 60    /    11 X 12 = 134   x
                                  6 X 12 = 72    /    12 X 12 = 144   /
          Press Space for another go.  Press C for correct answers.
```

The tables testing program reporting results



```
     Type the word shown. Use capitals only if they are in the word.
                                  captor        /  victor        /
                                  emperor       /  error         /
David, you got 12 out of 12.      doctor        /  actor         /
                                  senior        /  junior        /
You took 0 minutes 51 seconds.    inventor      /  mirror        /
                                  visitor       /  sailor        /
          Press Space for another go.  Press C for correct answers.
```

The same program modified to check spelling

transfer Basic files – and we'll be publishing some in a future issue – to get you going without the bother of typing in listings or buying programs, the panel on the right shows how you can transfer Basic programs quickly and easily.

The two programs accompanying this article will work either on a BBC Micro or a Z88. **Tables** is an adaptation of the tables testing program. **Spell** is a modification of it to make it in to a spelling test.

Rather than typing it in from scratch, you can just edit Tables. If you are using these programs on a BBC Micro, remember to include the window command as line 1.

● *Next month I'll be giving you more programs and tips for the Z88. If you have any hints or questions, or have written any software for Sir Clive's micro, don't hesitate to write in ...*

BBC Micro/Z88 program transfer

● Connect the micros using a cable as shown in Figure I.

● On the panel of the ZX88 set the baud rates to 9600, parity to none and Xon/off to on. These are the default settings so, unless you've ever changed them, they'll already be correct.

● Load your program into the BBC Micro.

● Select Import/Export on the ZX88, press R and enter a filename.

● On the BBC Micro enter:

```
*FX3,1
LIST
*FX3,0
```

● The file will transfer and once the listing stops on the BBC Micro, press Escape on the ZX88

● Load the file into Pipedream

● Remove any non-program data from the start and end of the file and put these lines at the start:

```
#B
.J
NEW
```

● Save the document as plain text.

● Select Execute from the ZX88 Filer and your program will load

● SAVE the program as you would any Basic file and it can then be CHAINed or LOADed as usual. If you use the same filename as the file you transferred, it will erase that and save memory.

Tables testing program for the Z88

This program aims to test children on their tables, giving the time taken to offer a challenge to those who already know them and want to become more proficient.

Before the test starts you will be asked whether you want the questions in numerical order or mixed up. By opting for questions in numerical order you can learn your tables by adding the last number, while random order gives you the chance to prove that the tables have been throughly learnt.

Each response is marked with a tick or cross and when the test has been completed you can have the correct answers printed instead of yours, with the marks remaining allowing you to see where you went wrong.

Program I: Tables tester

```
   1 REM TABLES
   2 REM (c) The Micro User
  10 DIMN(12):S=0
  20 CLS:PRINT'SPC20"Z88   TABLES TEST
By Peter Davidson"
  30 INPUT"What is your name? "N$
  40 CLS:PRINT"Hello "+N$
  50 PRINT"Do you want your tables in
order or mixed up? (Press O or M) ";
  60 C$=GET$:IFC$<>"O"ANDC$<>"o"ANDC$<>
"M"ANDC$<"m"THEN60
  70 IFC$="M"ORC$="m" C=1 ELSE C=0
  80 PRINTC$
  90 INPUT"Which table (0 - 12)? "T:IF
T<0 OR T>12 THEN VDU11,11,7:GOTO90
 100 CLS:FORI=0TO12:N(I)=I:NEXT
```

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◀ From Page 67

```
  110 TIME=0:FORQ=1 TO 12
  120 IFC=0 THEN QU=Q ELSE R=RND(13-Q):Q
U=N(R)+1:FORI=R TO 11-Q:N(I)=N(I+1):NEXT
  130 PRINTTAB(3,1)STR$(QU)+" X "+STR$(T
)+" = ";:INPUT""W$
  140 PRINTTAB(3,1)STRING$(20," ")
  150 AN=VAL(W$):IFAN=QU*T THEN S=S+1:M$
=" /" ELSE M$=" x"+CHR$7
  160 PRINTTAB(40+20*((QU-1)DIV6),(QU-1)
MOD6+1)STR$(QU)" X "STR$(T)" = "STR$(AN)
TAB(54+20*((QU-1)DIV6),(QU-1)MOD6+1)M$
  170  NEXT
  180 PRINTTAB(0,3)N$+", you got "+STR$(
S)+" out of 12."
  190 PRINTTAB(0,5)"You took "+STR$((TIM
E DIV 6000))+" minutes "+STR$((TIME DIV
100)MOD 60)+" seconds."
  200 PRINTTAB(12,7)"Press Space for ano
ther go.  Press C for correctanswers.";
:REPEAT a=GET: UNTIL a=32 OR a=67
  210 IFa=67 OR a=99 FORQU=1 TO 12:PRINT
TAB(40+20*((QU-1)DIV6),(QU-1)MOD6+1)STR$
(QU)" X "STR$(T)" = "STR$(QU*T)"   ":NEX
T:GOTO200
  220 RUN
```

Get it right!

```
  1 =    0 0 |  70 = 8FFA 0 | 150 = 2CA7 A
  2 =    0 0 |  80 = E81B 6 | 160 = 4C0B A
 10 = 91FE E |  90 = CEA8 B | 170 = 2C83 0
 20 = F879 1 | 100 = FF1C 3 | 180 = AC6F 5
 30 = BF81 D | 110 = D359 0 | 190 = 55C9 3
 40 = F1D0 F | 120 = 63E4 D | 200 = 5B09 4
 50 = 9177 2 | 130 = 2EAE 8 | 210 = 2703 D
 60 = 3611 A | 140 = D2E8 A | 220 = 7E36 9
```

Spelling/Typing test

The form of this program is the same as Tables. The aim is to improve spelling and, as the test is timed, typing speed will hopefully also get better.

The spellings to be tested are in sets of 12 words contained in data statements starting at line 1000. These must go up in 1000s and the number you include is determined by the variable *NS*, initialised in line 10.

Children can, therefore, be given groups of words to learn, and this program used to test them either in the order they were given or at random.

Note that the words must be typed in with capitals and lower-case letters exactly as they are in the data.

Program II: Spelling/Typing tutor

```
    1 REM SPELL
    2 REM (c) The Micro User
   10 DIMN(12),W$(12):S=0:NS=4
   20  CLS:PRINT'SPC16"Z88   SPELLING/TY
PING TEST   By Peter Davidson"
   30 INPUT""What is your name? "N$
   40 CLS:PRINT""Hello "+N$
   50 PRINT""Do you want the questions i
n order or mixed up? (Press O or M) ";
   60 C$=GET$:IFC$<>"O"ANDC$<>"o"ANDC$<>
"M"ANDC$<"m"THEN60
   70 IFC$="M"ORC$="m" C=1 ELSE C=0
   80 PRINTC$
   90 PRINT""Which set (1 - "STR$NS")? "
;:INPUT""T:IFT<1 OR T>NS THEN VDU11,11,7
:GOTO90
   95 RESTORE (T*1000)
  100 CLS:FORI=1TO12:N(I)=I:READW$(I):NE
XT:PRINTSPC5"Type the word shown. Use ca
pitals only if they are in the word."
  110 TIME=0:FORQ=1 TO 12
  120 IFC=0 THEN QU=Q ELSE R=RND(13-Q):Q
U=N(R)+1:FORI=R TO 11-Q:N(I)=N(I+1):NEXT
  130 PRINTTAB(3,2)W$(QU);:L$=GET$:PRINT
TAB(3,2)SPC10:PRINTTAB(3,2)L$;:INPUT""W$
:W$=L$+W$
  140 PRINTTAB(3,2)STRING$(20," ")
  150 IFW$=W$(QU) THEN S=S+1:M$=" /" ELS
E M$=" x"+CHR$7
  160 PRINTTAB(40+20*((QU-1)DIV6),(QU-1)
MOD6+1)W$TAB(56+20*((QU-1)DIV6),(QU-1)MO
D6+1)M$
  170 NEXT
  180 PRINTTAB(0,3)N$+", you got "+STR$(
S)+" out of 12."
  190 PRINTTAB(0,5)"You took "+STR$((TIM
E DIV 6000))+" minutes "+STR$((TIME DIV
100)MOD 60)+" seconds."
  200 PRINTTAB(12,7)"Press Space for ano
ther go.  Press C for correct answers.";
:REPEAT a=GET: UNTIL a=32 OR a=67
  210 IFa=67 OR a=99 FORQU=1 TO 12:PRINT
TAB(40+20*((QU-1)DIV6),(QU-1)MOD6+1)W$(Q
U)"   ":NEXT:GOTO200
  220 RUN
  999 REM data sets start on lines in mu
ltiples of 1000: 12 in each: Change NS i
n line 10 for number of sets.
 1000 DATAback,pack,slack,rack,whack,sta
ck,sack,book,cook,spoon,shook,hook
 2000 DATAcaptor,emperor,doctor,senior,i
nventor,visitor,victor,error,actor,junio
r,mirror,sailor
 3000 DATApeck,deck,wreck,speck,speck,ne
ck,jerk,serve,fern,stern,chief,field
 4000 DATAstick,pick,chick,lick,kick,qui
ck,tick,sheet,week,beech,reed,feet
```

Get it right!

```
  1 =    0 0 |  90 = 41FB E |  180 = AC6F 5
  2 =    0 0 |  95 = 8277 7 |  190 = 55C9 8
 10 = D522 2 | 100 = 952B 1 |  200 = 3778 3
 20 = 8A73 7 | 110 = D359 E |  210 = 9A51 B
 30 = BF81 3 | 120 = 63E4 5 |  220 = 7E36 4
 40 = F1D0 2 | 130 = 8552 6 |  999 =    0 4
 50 = BA7E 7 | 140 = 6327 D | 1000 = 7297 D
 60 = 3611 1 | 150 = 69DD 6 | 2000 = 8737 E
 70 = 8FFA D | 160 = 8B61 2 | 3000 = ADCC 4
 80 = E81B 0 | 170 = 2C83 0 | 4000 = 822B 1
```

The

Julia Battle presents

a devious mini fantasy

adventure for the Z88

THE Golden Crown is a short program which demonstrates how to write intriguing chaining puzzles in your own home-grown adventure games.

The program will run on any BBC Micro or Z88. If you intend to use it on the latter, the best approach is to enter it into a BBC Micro first, check it using Get it Right! and then transfer it to your Z88.

The routine is in fact a complete adventure game in its own right and can be played as such, though it would be better incorporated within a much larger program. Seasoned adventurers will find the solution fairly straightforward and shouldn't take too long to work it out, but novices may find it an interesting and stimulating brain teaser.

Puzzles

Chaining puzzles are quite common in text and arcade adventures and involve a central problem whose solution requires several logical steps which must be performed in a set sequence.

For instance, suppose you want to have a drink from a well, but can't reach the water.

A possible solution to this problem may be to dig for gold dust in the mountains nearby, take it to town and exchange it for money in order to buy a rope and bucket. The bucket can be tied to the rope and lowered down into the well to fetch the water. Now you can have a drink.

So you have a series or chain of linked puzzles which must be solved in order: You need a bucket to get the water and rope to lower it down the well, but require money to buy them both and some valuable object to trade to get the money.

Locations

There are just 16 separate locations in The Golden Crown and the adventure is based in the far-away land of Karnia. The King's crown has been stolen by one of his enemies and it is your task to recover it.

In return for this favour, the King will knight you and great wealth will be yours.

The command parser, although rudi-

Golden Crown

mentary, will understand instructions like: NORTH, SOUTH, EAST, WEST, TAKE, UNLOCK, KILL, EXAMINE and so on. Abbreviations may confuse it so don't try any.

The vocabulary of words understood by the program is stored in *v$*. The location descriptions are in *r$()*, the exits in *e$()*, objects in *ob()* and messages in *m$()*. When an object is taken its location number stored in *L()* is set to 16. If it needs to be removed from the game it is set to 32. Your current location is held in the variable *p*.

That just about rounds up this adventure. Over the next few months we'll be publishing more and if you've written any you'd like considered just send them in.

```
   10 REM The Golden Crown
   20 REM A mini adventure
   30 REM By Julia Battle
   40 REM (c) The Micro User
   50 CLS
   60 PROCinitialise
   70 PRINT"Welcome to Karnia..."
   80 PRINT"Your task is to find the Kin
g's"
   90 PRINT"stolen crown and return it t
o him."
  100 PRINT ' "Please type in UPPER case
..."
  110 INPUT ' "Enter your name:"name$
  120 REPEAT
  130 PRINT ' "You are in ";r$(p);"."
  140 IF p=11 AND f(1)=0 PRINT m$(1)
  150 IF p=4 PRINT"A";L$;"safe is here."
  160 FOR i=1 TO 13
  170 IF L(i)=p PRINT"A ";ob$(i);" is he
re."
  180 IF L(i)=16 PRINT"You have a ";ob$(
i);"."
  190 NEXT
  200 INPUT "What now";c$
  210 IF c$="" THEN 200
  220 c$=LEFT$(c$,3)
  230 i=INSTR(v$,c$) DIV 3
  240 IF i=0 PRINT"Eh?":GOTO 200
  250 ON i GOSUB 620,620,620,620,550,530
,510,470,410,390,350,320
  260 UNTIL finished
  270IF p<>6 OR L(13)<>16 THEN END
  280 PRINT"The King takes the crown..."
  290 PRINT"You are knighted - arise sir
 ";name$
  300 END
  310
  320 IF p<>4 OR L(6)<>16 PRINT"Eh?":RET
URN
  330 L$="n open ":L(13)=4
  340 RETURN
  350 IF p<>1 OR L(10)<>16 PRINT"Ok":RET
URN
  360 PRINT"A hidden door slides open"
  370 e$(1)="WESSOUEAS"
  380 RETURN
  390 IF L(10)=16 PRINT m$(10) ELSE PRIN
T"Seems ordinary..."
  400 RETURN
  410 IF p=6 PRINT m$(9):finished=1:RETU
RN
  420 IF L(7)<>16 PRINT m$(9):finished=1
:RETURN
  430 PRINT"You stab him with the knife.
..he's dead."
  440 IF p=8 L(3)=32
  450 IF p=9 L(4)=32
  460 RETURN
  470 IF p<>11 OR f(2)<>1 OR L(11)<>16 P
RINT m$(7):RETURN
  480 PRINT'm$(3):PRINT m$(4)
  490 L(12)=16:L(11)=32:f(1)=1
  500 RETURN
  510 IF L(9)=16 PRINT"Ok":f(3)=1 ELSE P
RINT"Eh?"
  520 RETURN
  530 IF L(11)=16 AND p=12 PRINT"Ok":f(2
)=1 ELSE PRINT m$(6)
  540 RETURN
  550 IF p=3 AND L(12)<>16 PRINT m$(2):R
ETURN
  560 IF p=9 AND L(4)=9 PRINT m$(2):RETU
RN
  570 FOR i=6 TO 13
  580 IF L(i)=p L(i)=16
  590 NEXT
  600 IF p=3 L(12)=32:PRINT m$(8)
  610 RETURN
  620 d=INSTR(e$(p),c$)
  630 IF d<1 OR d>10 PRINT"Can't go that
 way":RETURN
  640 IF p<>8 OR i<>1 THEN 660
  650 IF f(3)=0 PRINT m$(2):RETURN
  660 p=p+4*(i=1)-4*(i=3)+(i=4)-(i=2)
  670 IF p=6 AND L(13)=16 finished=1
  680 RETURN
  690
  700 DEF PROCinitialise
  710 DIM r$(15),e$(15),ob$(13),L(13),m$
(10),f(10)
  720 v$="***NOREASSOUWESTAKFILWEATHRKIL
EXASHAUNL"
  730 L$=" locked "
  740 FOR i=0 TO 15
  750 READ a$,e$(i):r$(i)=MID$(a$,4)+LEF
T$(a$,3)
  760 NEXT
  770 FOR i=1 TO 13
  780 READ a$,L(i):ob$(i)=MID$(a$,4)+LEF
T$(a$,3)
  790 NEXT
  800 FOR i=1 TO 10
  810 READ a$:m$(i)=MID$(a$,4)+LEFT$(a$,
3)+"!"
  820 NEXT
  830 p=6:finished=0
  840 f(1)=0:f(2)=0:f(3)=0
  850 ENDPROC
  860
  870 DATA ooma secret r,EAS,larthe cel,
EASSOU,urythe armo,WES,hopa s,SOU
  880 DATA allthe main h,EASSOU,henthe k
itc,WESNORSOU,acethe King's pal,EASSOU,e
etthe main str,NORSOUWES
  890 DATA ncethe castle entra,NOREASSOU
,ndsthe castle grou,NORWES,estthe for,NO
RSOUEAS,agean elf's cott,NORSOUWES
  900 DATA eama shallow str,NOREAS,hesth
ick bus,NOREASWES,estthe for,NOREASWES,h
eda small s,WESNOR
  910
  920 DATA pershopkee,3,ingK,6,ardcastle
 gu,8,ollgiant tr,9,"elfsmall ",11
  930
  940 DATA "keysilver ",0,gerlong dag,2,
assred identity p,3,oakcl,3,ollbattered
scr,9,ketlarge buc,15,oldbag of g,32,own
cr,32
  950
  960 DATA ireIt's on f,"youHe won't let
 ","outThe fire is ",oldThe elf gives yo
u a bag of g,wayIt gets swept a,ithWhat
w,oodThat won't do any g,oldHe takes you
r bag of g,eadHe stabs you with a knife.
..you're d,ZAMIt says SHA
```

Get it right!

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 =    0 0
 50 = 7A16 6
 60 = 30B2 4
 70 = 2FE9 7
 80 = 5889 3
 90 = ECEE 1
100 = 623E 5
110 = 7986 4
120 = BFBA F
130 = 3040 9
140 = A812 1
150 =  EED F
160 = 7EFE F
170 = 478B 0
180 = BE0E 4
190 = 2C83 C
200 = 8C69 0
210 = 97E2 C
220 = B048 C
230 = 41EC 8
240 = 956F 0
250 = AF6C 8
260 = DC52 1
270 = 59F0 0
280 = DEEB 3
290 = 3085 7
300 = FD2E B
310 =    0 B
320 = 9D88 B
330 = EB09 2
340 = 6E17 F
350 = 60A9 5
360 = 6878 7
370 = B35A 2
380 = 6E17 B
390 = C1DC D
400 = 6E17 F
410 =  364 6
420 = B901 D
430 = 89FB 4
440 =  EFC A
450 = 820B 4
460 = 6E17 A
470 = BCE0 9
480 = 235D 0
490 = 508D F
500 = 6E17 F
510 = 473B 0
520 = 6E17 F
530 = 77F3 9
540 = 6E17 4
550 = BEF7 D
560 =  F5B B
570 = B6BF 8
580 = 8787 8
590 = 2C83 8
600 = 685F E
610 = 6E17 4
620 = 8DFD 8
630 = F96F 3
640 = 5BD3 9
650 = 13BA E
660 = 5044 4
670 = 8FD0 D
680 = 6E17 7
690 = 5485 9
700 = EC42 D
710 = BFA3 2
720 = A4C4 0
730 = C232 E
740 = 5B98 1
750 = A21C 4
760 = 2C83 2
770 = 7EFE 8
780 = 3D94 2
790 = 2C83 0
800 = 4E9D 8
810 = 11A1 3
820 = 2C83 C
830 = 517E 5
840 =  9FC 6
850 = ED0F 4
860 =    0 4
870 =  8F1 6
880 = 89BF E
890 = 320D 6
900 = C0D0 B
910 =    0 B
920 = A3CA A
930 =    0 A
940 = D211 E
950 =    0 E
960 = D67C C
```

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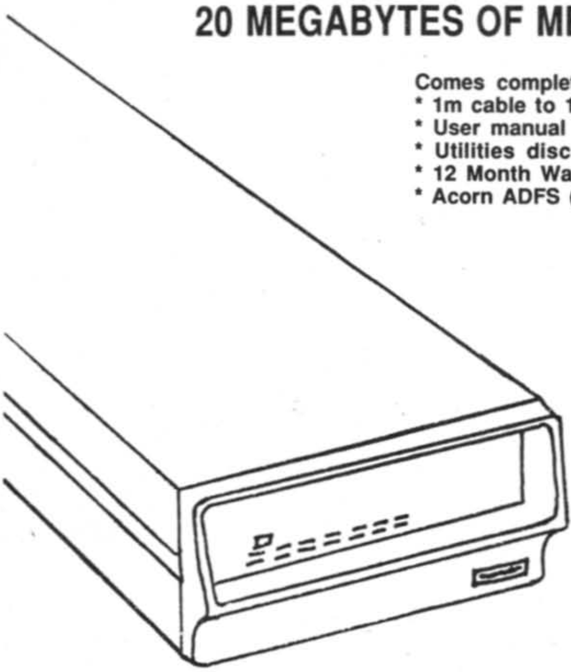

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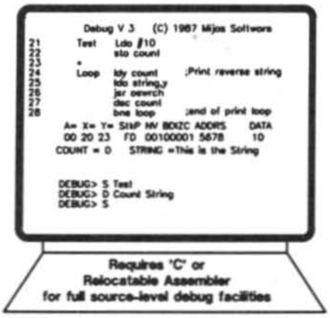

```
              Debug V 3   (C) 1987 Mijas Software
21         Test    Lda #10
22                 sta count
23         *
24         Loop    ldy count       ;Print reverse string
25                 lda string,y
26                 jsr oswrch
27                 dec count
28                 bne loop        ;end of print loop
      A= X= Y= StkP NV BDIZC ADDRS     DATA
      00 20 23  FD  00100001 5678      10
     COUNT = 0    STRING =This is the String


      DEBUG> S Test
      DEBUG> D Count String
      DEBUG> S
```

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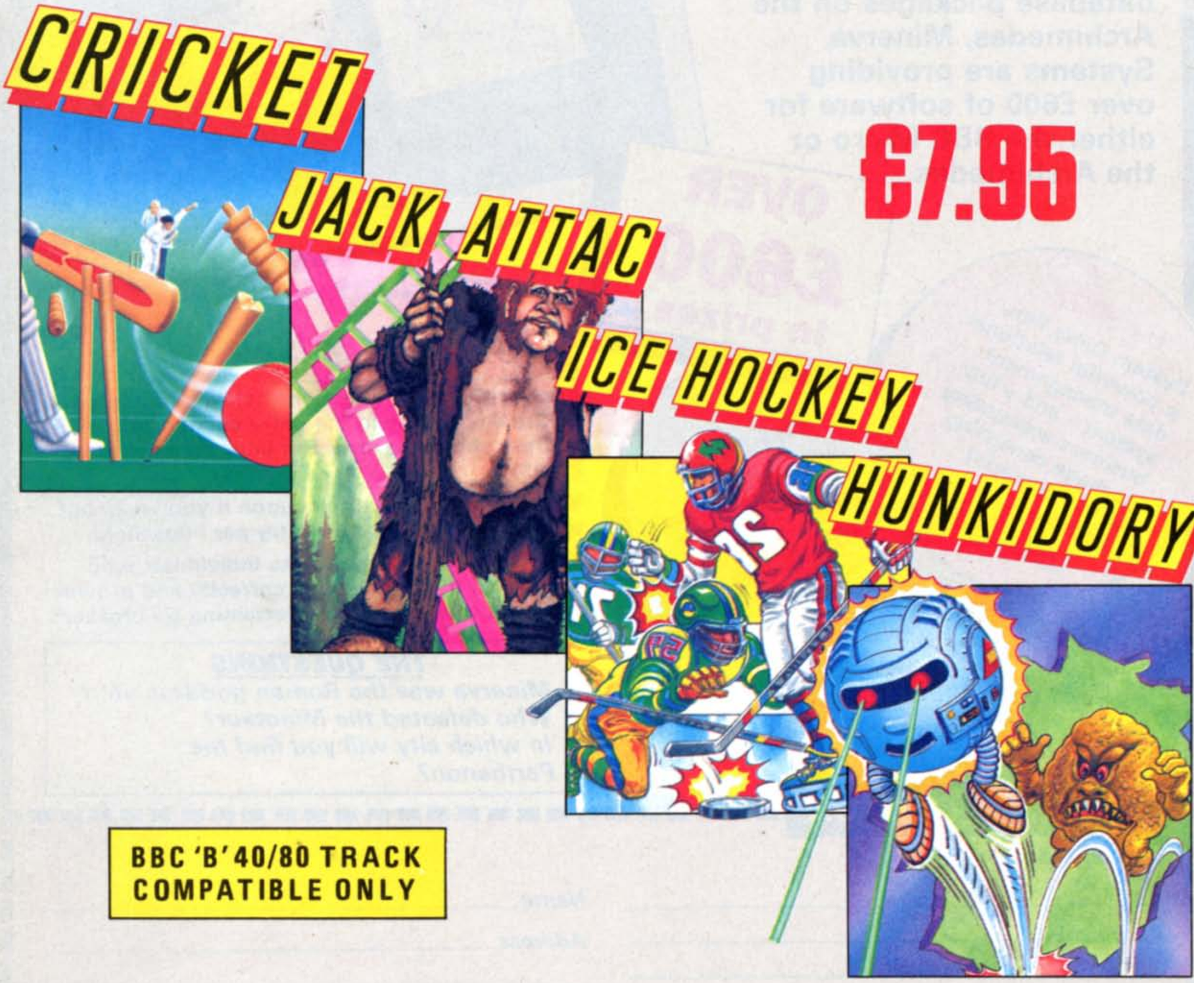
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Ian Whitmore tries out a new disc-based drawing package

Art without extravagance

THE software market has seen a wealth of drawing products for the Acorn series of micros since the introduction of AMX Art. All but the simplest are rom-based, and thus restricted to use on the machine in which they are installed. It was thus a pleasant surprise to realise that Nidd Valley's Illustrator offers a wide selection of drawing facilities, operates entirely from disc and is compatible with the B, B+ and Master 128 micros.

In use it is simplicity itself: The disc is placed in drive 0 and booted. The Illustrator screen (Figure I), which is in Mode 4, is displayed, with a margin on three sides. Default colours are red and white, for greatest contrast on TV screens, but are alterable to whatever combination you choose with the Tab and Shift+Tab keys.

While a mouse provides the best way of controlling the software, you can use the cursor keys instead in combination with Copy, Return and Delete.

The left and lower margins of the screen contain icons to allow the selection of patterns, brushes, and submenus. Clicking over the menu icon on the left margin flips between two sets of menu words on the top margin. When each top margin word is selected by clicking (using the mouse to place the screen pointer over it and pressing execute on the mouse), it opens a pull-down window, displaying a submenu.

Within this submenu each item can be selected by moving the highlight bar up or down with the mouse and clicking. One particularly irritating feature of Illustrator concerns the allocation of functions to buttons.

Whereas most drawing systems use the lefthand button for execute, the middle for move and the right for cancel, Illustrator exchanges left and middle. This appears to be to suit Nidd Valley's linear lock feature on their own Digimouse when used with AMX-compatible software.

A function key strip is provided with labels for nine of the keys. They allow you to alter the x,y, ratio shapes (such as ellipses) and to rotate the axes of these shapes. In addition the function keys support certain standardised magnifications for the copy routines.

The first set of words on the top menu bar – menu 1 – gives access to all the different drawing modes (lines, spray, text, rectangles, triangles, curved shapes, fill). A zoom facility enables you to modify enlarged areas of the picture by switching individual pixels on or off.

The area of screen seen is a comfortable compromise between sufficient enlargement to make editing worthwhile and a low enough magnification to retain an impression of the real shape.

Menu 2 supports a number of further enhancements such as gridlock, copy, and solid/outline. Also from this menu you can select whether lines are drawn in foreground, background, solid, dotted or inverse colour.

You can select the text font from six available and have access to a number of special effects. One of the most impressive allows the application of Boolean algebra to your drawings. When areas are drawn overlaying each other, the pixels that overlap can be ANDed, ORed, EORed or ABSed. This creates interesting effects such as Moire patterns, shown in Figure II.

Icons are supported from within the options submenu. With this you can create and modify 16x16 pixel icons in the same way as a normal picture and then move them into the pattern or brush areas. Once placed they are available for use as brushes or patterns and may be used for fills, spraying and so on.

Icons on the left-hand side of the screen select between menus one and two, allow access to discs, clear the screen, show the brushes loaded and the extent of the pixel editor window and offer an expansion menu. Disc access provides for loading and saving pictures, patterns, icons and brushes.

The expansion menu offers a more elaborate flood fill to cope with irregular shapes, three varieties of cut and paste and various printer facilities. Cut and paste allows an area of screen to be copied anywhere on the screen at a size determined by the mouse – larger or smaller than the original. Proportional Copy is the same facility using the function key defined magnification ratios.

There are also two similar options to grab areas from screens saved on disc

Turn to Page 75 ▶

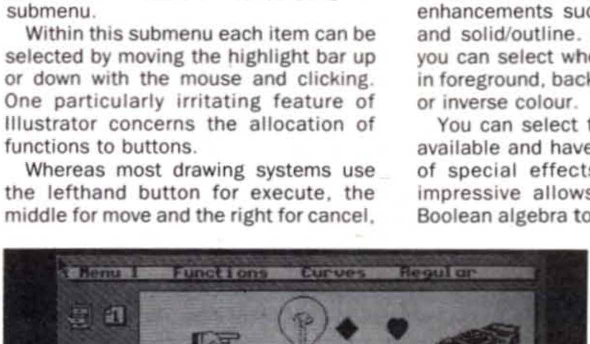

Figure I: Main screen with some of the supplied artwork

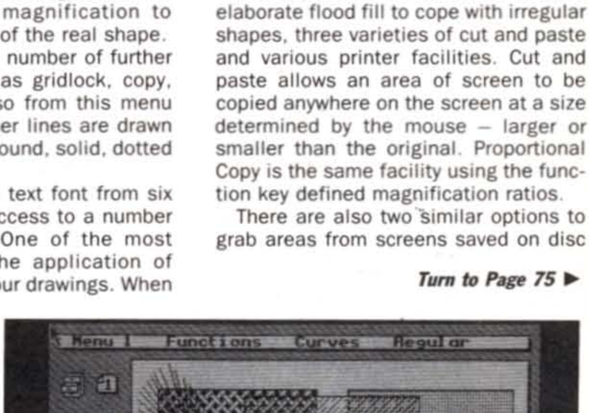

Figure II: Example patterns using Boolean mix facility

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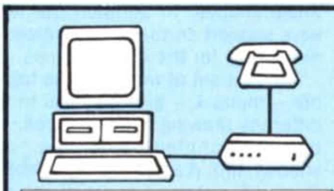

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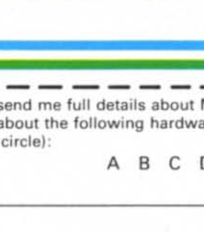
B	*Dataphone: Demon V21, V23 auto-dial, auto-answer modem + Z-ROM + Disc-Connect software (£96.49)*
C	*Pace: Nightingale V21, V23 manual dial modem + Commstar II rom (£98.90)*
D	*Beebug: V21, V23 auto-dial, auto-answer modem + Comms rom (£104.20)*
E	*Miracle: WS4000 V21, V23 auto-dial, auto-answer modem + Dialup (£285.39)*

All you need – apart from your BBC Micro – is a modem, which plugs into your telephone wall socket, plus suitable communications software.

We have provided a list of possible combinations below, ranging from the very cheapest to ones which can automatically dial the MicroLink telephone number and connect you to the service – all you have to do is type in your personal security password.

Whichever equipment you use, you will be able to call MicroLink, open your mailbox, save to disc any messages waiting for you, and disconnect in as little as two minutes.



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MU2

◀ *From Page 73*

and copy them to the current screen at the same or altered size.

Illustrator is reasonably well served with regard to printouts. Although the built-in driver only supports Epson-type dumps, a program on the disc allows you to alter all the parameters necessary to support the majority of printers.
However, it does not allow the program to be configured to send linefeeds with carriage returns, so if like me you have another item of software that requires auto linefeed on the printer to be switched off then you will have to switch it back on to support illustrator – there is no warning of this in the manual. Printouts are of differemt sizes and can be placed on the page to allow for text. A sample printout is shown on Figure III.

The manual is only 12 pages long and in many areas it is too brief for the beginner, assuming quite a degree of knowledge. On the disc are supplied a number of alternate brushes, patterns, icons and screens.

I consider this to be very good for a disc-based package, providing far more facilities than I would have expected from such a system. Although it is not as good as QuestPaint or AMX Art, it is inexpensive and portable between machines so I can recommend it if you require a simpler system for use on many machines.

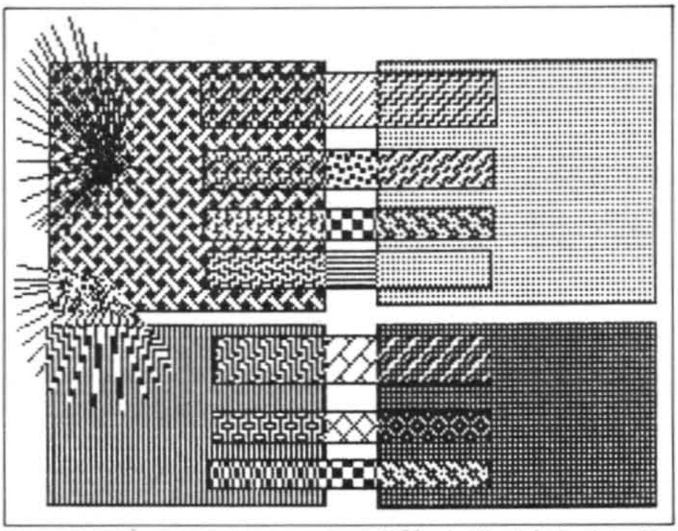

Figure III: A dump of Figure II on an Epson LX80 using the default printer driver

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BT software for students

A RANGE of educational software of special interest to the science student has been released for the BBC Micro by British Telecom.

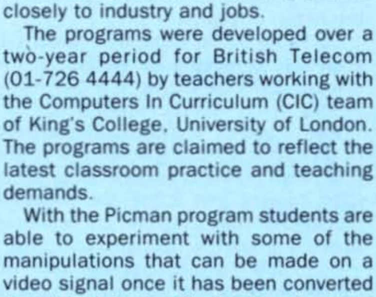
The programs, which are being subsidised by BT, have been designed to give 15 to 18 year old students real-life problems to solve and are intended to make school syllabusses relate more closely to industry and jobs.

The programs were developed over a two-year period for British Telecom (01-726 4444) by teachers working with the Computers In Curriculum (CIC) team of King's College, University of London. The programs are claimed to reflect the latest classroom practice and teaching demands.

With the Picman program students are able to experiment with some of the manipulations that can be made on a video signal once it has been converted to digital form. Students can then modify prepared images or create new pictures.

It is based on the assumption that a television or video picture can be converted into a stream of numbers, processed and re-transmitted.

A simplifed version of the process is used to demonsrate the various ways of altering information to produce a modified picture.



Another program – Sigtran – deals with the process of transferring signals from one place to another. The interactive icon-driven program involves pupils in designing a telephone link, taking into account all the problems encountered with sending signals.

The students aim is to set up, transmit and receive a comprehensible signal from one exchange to another, picking up as little distortion as possible.

British Telecom software in use in the classroom

With the Pulsmod program it is possible to gain an insight into converting analogue signals – speech or video – into digital form and decoding them back into their original form. Both sampling methods and the effects of distortion are covered.

According to a BT spokesman all the programs have been produced to interest youngsters in the possibilities of job prospects in information technology related industries. Price £15 each.

Maths answers

FOR students who spend hours trying to do their maths homework, and keep getting the wrong answer but don't know why, Symbolic Calculus from Maths Workshop may just help.

The program has been designed around the concept that the software must show all of the steps to working out the solution to a set problem.

Symbolic Calculus also describes which techniques are being applied at every step, thus showing the student where mistakes have been made.

Maths Workshop (01- 511 5244) says its system for the BBC Micro uses an edit-and-solve approach with the user having complete control over the solution process.

The program can differentiate or integrate polynomials, trigonometric and inverse trigonometric functions, hyperbolic and inverse hyperbolic functions, natural logs, exponentials, and up to four arbitary constants all of which can be combined in any way up to a limit of 100 characters.

With problems in integration, the system tries different ways – if one method does not succeed the program recognises that others may be applicable and restarts the calculation process. Price £15.95 on cassette and £16.95 on disc.

WP upgrade

THE popular children's word processing program PenDown from Logotron (0223 323656) now has several additional utilities.

Some of the new files in PenDown Extra 1 and 2 include eight fonts – Broadway, Jupiter, Script, Smile, Fleur, Holiday, Script and Numero.

A set of larger and lower-case infant letters are also included as well as two font files containing graphic characters.

The graphic sets feature insect motifs and runic designs, there are characters for creating a border around text, and a utility for printing in double strike mode.

Also on the PenDown Extra discs but slightly away from the word processing theme are two adventures which show teachers the educational possibilities of Logotron's Adventure Writer program.

Problem solving and decision making are the themes behind the Money adventure which involves children in trying to decide which shops to go to and what to spend their pocket money on.

The other game, Gates, is a complex text adventure aimed at helping children with their reading, spelling, and problem solving abilities.

A useful sign writer facility which allows text to be enlarged up to eight times in height and width for creating banners and posters is also included as standard. Price £34 for the entire package or £9 for an upgrade.

Text files without tears

Mike Bibby tries to make the teacher's task a little bit easier

RECENTLY a teacher friend of mine bemoaned the fact that while her LEA was willing to spend wildly to the extent of giving each pupil in her computer classes his or her personal disc, it drew the line at the expense of duplicating her course notes.

"What I could do with Mike", she hinted," is a way of putting on to their discs the notes I've prepared with Mini Office II. Of course we've only got the one copy of Mini Office II, so it has to display the notes at their end without using a word processor. Any ideas?"

Well I had as it happened, but before attempting them I used my standard design procedure, which is to walk into the *Micro User* office and casually mention the problem to the lads there.

"You'll be using *TYPE to print out the text, won't you?" remarked Pete Davidson without looking up from an article he was covering in red marks – one of mine, I'm sure.

"And you'll use the VDU equivalent of Control+N to get it to page out nicely", he continued helpfully.

"Yes", I lied, and ad libbed, "I was just trying to sort out how to prompt the pupils to press Shift to get a new page".

Then Steve Turnbull popped up from behind an Archimedes. "Simple", he said, "just use text windows. And don't forget to write your prompt *before* you start TYPEing the text," he added enigmatically.

At this point, as they say, I made my excuses and left. Having abandoned my horrendously complicated solution to the problem, I rushed home to code the lads' ideas. Text Writer is the result.

What you do is to prepare your text files in Mini Office II or Wordwise – so you get the benefit of tabs, centring, fixed line lengths and so on – and then spool it out in Ascii form.

You then copy these files to the disc you're preparing which should also have a copy of Text Writer on. Run the latter and your file will be displayed page by page with a neat prompt telling you to press Shift to continue.

As Steve suggested, it uses text windowing, a useful feature of BBC Basic that's often neglected – a pity because it's simple to use and can often enhance the appearance of a program.

Windowing means sectioning off a rectangular portion – or window – of your normal screen. You decide how wide and tall this rectangle is, and where it goes on the screen. From then on your BBC Micro considers itself restricted to that section of the screen as far as PRINTing text is concerned.

For instance if you've defined a text window so that it occupies just the top half of the screen, when you've filled up that half with text, any more PRINTing will cause the text already there to scroll up – as it normally does when you reach the bottom of the screen.

Interestingly, any text that you happen to have left on the bottom half of the screen will be unaffected by the scrolling, or indeed any of your PRINT statements. And even a CLS will only clear the top half – your current text window.

We use this idea of "window independence" to good effect in Text Writer. Before we go into that, though, we'd better see how to define a text window.

You're probably thoroughly familiar with the fact that different mode screens allow you varying numbers of lines per screen and characters per line. Mode 6 for instance gives you 40 characters per line – peversely numbered 0 to 39 – and 25 lines – numbered 0 to 24.

In fact we use these numbers to specify a character "cell" on the screen. In terms of screen or (x,y) coordinates, (0,0) is the character at the top-left of the Mode 6 screen, while (39,24) gives that at the bottom-right. Different modes will give us different numbers for the latter, of course.

So using a text window restricts our access to a rectangular section of the screen. But how do we tell the micro exactly which section we want?

Well, if you think about it, all you need to do to pin a rectangle down is to tell your micro where its bottom-left and top-right corners are: Since the window's rectangular your computer can work out where the other two corners go.

So to define a text screen we use VDU 28 followed by the text screen coordinates of its bottom-left and top-right character cells. Figure I shows how it works for a general text window. You use:

```
VDU 28,blx,bly,trx,try
```

where *blx* is the x coordinate of the bottom-left corner, try is the y coordinate of the top-right corner and so on.

For instance to make the text window

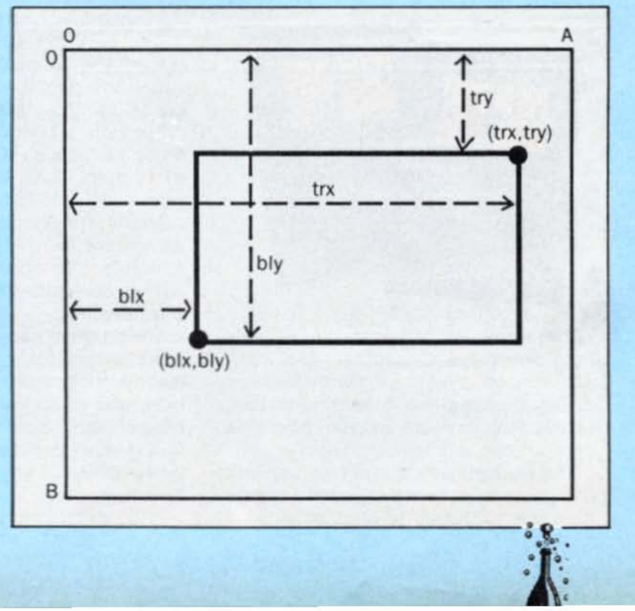


Figure I: Text window given by VDU28,blx,bly,trx,try

Horizontal text characters

Modes	Possible values: blx,trx,A	Max. char. per line
0,3	0-79	80
1,4,6,7	0-39	40
2,5	0-19	20

Vertical text characters

Modes	Possible values: bly,try,B	Max. no. of lines
0,1,2,3,4,5	0-31	32
3,6,7	0-24	25

Figure II: Possible sizes of text windows

the top half of a Mode 6 screen, say, enter:

```
MODE 6
VDU 28,0,12,39,0
```

Here (0,12) is the bottom-left corner – halfway down the screen, followed by (39,0), the top right. Try filling this up with something like:

```
10 FOR loop%=1 TO 25
20 PRINT "Line ";loop%
30 NEXT loop%
40 dummy$=GET$
50 CLS
```

You should see clearly that we've partitioned off the top half of the screen as far as text is concerned.

Figure II summarises the possible sizes of text windows for all the modes, so play about. One point of useful information is that:

```
VDU 26
```

sets the text window back to the size of the whole screen.

Text Writer uses two windows: A small one at the bottom of the screen and one rather larger one to display the text file. Figure III shows them both.

We use the bottom window to display our prompt messages (cunningly centered). As Pete pointed out we're going to be using *TYPE under the influence of VDU 14 (the equivalent of paging with Control+N) so that the text is printed out one windowful at a time, pressing Shift bringing up the next screen.

We start by turning interlacing off, entering Mode 6 and hiding our cursor (lines 30 – 50).

Line 60 sets up the prompt window, two lines deep at the bottom of the screen with:

```
60 VDU 28,8,24,31,23
```

Line 70 then prints a blank line (for separation from the text above) followed by our prompt. Note the semi-colon to stop the message scrolling. (Leave it out to see what I mean.)

Having got this out of the way first as Steve suggested, we now leave this window and define the upper one which we'll use to display our file in with:

```
80 VDU 28,0,22,39,0
```

From now on printing will be to this new text window, and as you can see from Figure III, it's been defined so as to leave the contents of our first screen unmolested: The prompt stays on screen all the time. That's why we did it first!

We then do all the hard work of printing out our text file with just two lines:

```
90 VDU 14
100 *TYPE TEST
```

Actually we've made some assumptions here. The most obvious is that the file we want printing is called TEXT – you can alter this easily enough.

One slightly more abstruse point is that, while the text screen is 40 characters wide – we're in Mode 6 – we have to present it with text created with a line length of 39 characters. This is easily achieved by using the embedded command:

```
LL39
```

at the head of your text in Mini Office II before spooling out your Ascii file.

The reason for this is that *TYPE automatically sends a Carriage Return (CR) and Line Feed (LF) to move you on to the next line when it reaches the end of the window. However, spooling out the Ascii version also sends out CR and LF at the end of each line.

So if your window's 40 characters wide and you just happen to be *TYPEing a line exactly 40 characters long, you get CR followed by LF twice, giving unexpected blank lines in your text. Making sure your maximum line length is 39 – one below the window width – stops this collision. Since you never reach the end of the window, the only CR+LF combinations come from the line ends of the spooled file.

*TYPE then continues to ladle out our text in window-sized chunks until it

Turn to Page 80 ▶

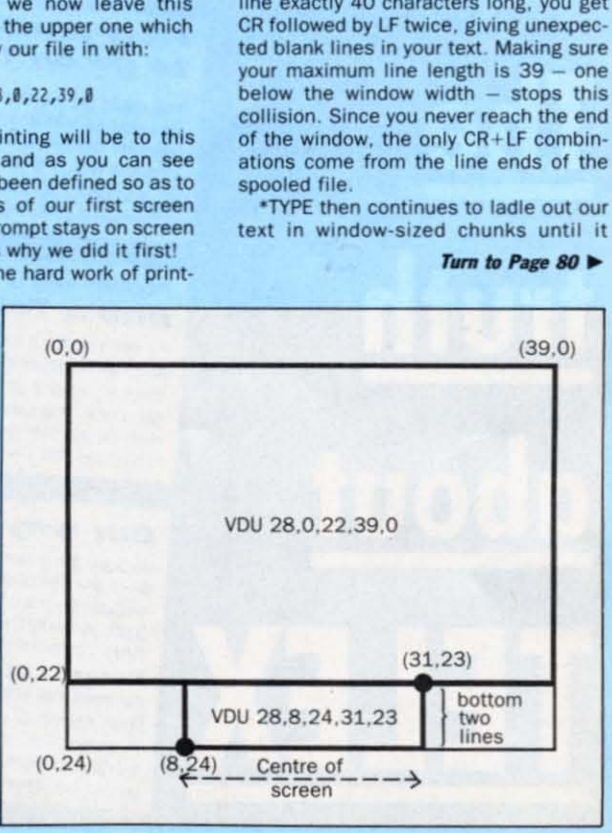


Figure III: The two windows used in Text Writer

◀ *From Page 79*

comes to the end of the file. At this point *TYPE just stops. So, to end with a bang rather than a whimper, we move back to the lower text window with line 110. We then clear this, print the new prompt "Press SHIFT to finish" and test for Shift (lines 120-140).

Having got a Shift, we clear the prompt (line 150), turn off paging mode (line 160), reset our text window to the whole screen (line 170) and beep (line 180).

The idea of:

```
190 VDU 31,0,24
```

is to move the cursor down to the bottom of the screen. Line 200 then turns it back on, while 210 flushes the keyboard buffer of any unwanted key presses, leaving everything neat and tidy.

And that's all there is to it. Of course there's lots of things you could tinker with – adding colour, say, or moving to a higher resolution mode. Perhaps I ought to pop in and visit the lads at *Micro User* again ...

```
 10 REM Text Writer
 20 REM (c) Micro User 1988
 30 *TV0,1
 40 MODE 6
 50 VDU 23,1,0;0;0;0;
 60 VDU 28,8,24,31,23
 70 PRINT "Press SHIFT to continue";
 80 VDU28,0,22,39,0
 90 VDU 14
100 *TYPE TEXT
110 VDU 28,8,24,31,23
120 CLS
130 PRINT "Press SHIFT to finish";
140 REPEAT:UNTIL INKEY(-1)
150 CLS
160 VDU 15
170 VDU 26
180 VDU 7
190 VDU 31,0,24
200 VDU 23,1,1;0;0;0;
210 *FX15,1
```

The Text Writer program

Using Text Writer

To make an auto-boot disc to display your text:

● On a blank, formatted disc create the one-line file !BOOT by entering:

```
*BUILD !BOOT
```

You'll get a 0001 prompt. Now enter:

```
CH."WRITER"
```

and then press Return followed by Escape at the 0002 prompt. This closes the file we're building.

● Enter:

```
*OPT 4 3
```

to make your disc boot from Shift+Break.

● Enter Text Writer and save it as WRITER with:

```
SAVE "WRITER"
```

● Using your word processor spool on to the disc an Ascii version of your file – line length 39 if you're using the program unmodified – under the name TEXT.

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to micro users on *MicroLink*. You can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free programs directly into your micro . . . and much more.

But why use Telex?

Because it's a standard means of instant communication between businesses. Today there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – it's just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

How to join: See Page 74

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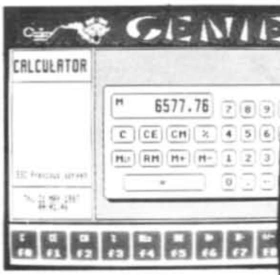

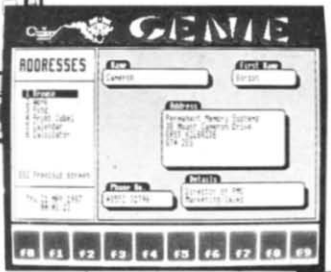

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GENIE Junior has exactly the same, highly praised, desktop utilities as its battery backed big brother—notepad, address book, diary, calendar and calculator—but Junior stores all its data on disk, not battery backed RAM.

GENIE Junior is available for all BBC Micros — B, B+, Master 128, Compact.

Disk formats supported—3.5", 5.25", DFS, ADFS (Ramdisk/Winchester/Network versions will be available—Contact Sales Office before ordering).

Compatible with sideways RAM, Shadow RAM, 65C02/512/Z80 second processors.

WHAT THE PRESS SAYS ABOUT GENIE

"MICRO USER" Oct 87 . . . *stunningly simple to use . . . neat, well packaged, well written . . .*

"ACORN USER" Aug 87 . . . *Genie is a superb package . . . I couldn't be without it . . .*

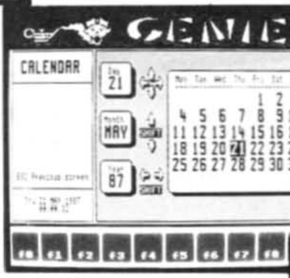
"Pop. Comp. Wkly" June 87 . . . *rapidly becomes an integral part of your system . . . well designed . . .*

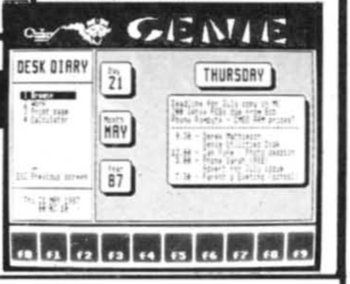
"A&B Computing" June 87 . . . *extreme friendliness of design . . . eminently practical piece of software . . .*

"Your Computer" July 87 . . . *a product which can stand alongside its 16 bit role model . . . one piece of software I have always wanted . . .*

"BEEBUG" Aug 87 . . . *extremely versatile . . . a most useful piece of firmware . . .*

Clearly the reviewers wanted Genie—now you can afford to have one!





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MU2

Heaven help the pupils

Bob Redrup takes a look at the future role of the BBC Micro in primary education

I RECENTLY attended a training day for primary school governors which was run by our local education authority. In itself, this was nothing remarkable – I'm sure all good education authorities do the same – and about 100 governors turned up on the day.

In addition to a superb lunch we also received good, sound presentations concerning various aspects of the way future developments in the educational world are going to affect school governors throughout the country.

We were also offered various sessions for smaller groups of governors, showing different sides of modern curriculum development.

I opted for religious education and computers. Both, it would appear, were minority sports where primary school governors were concerned.

I'll pass over the RE session, which had all the flavour and incisiveness of ancient gravy – it tried to be modern and worthy, and succeeded in being utterly dry and tasteless.

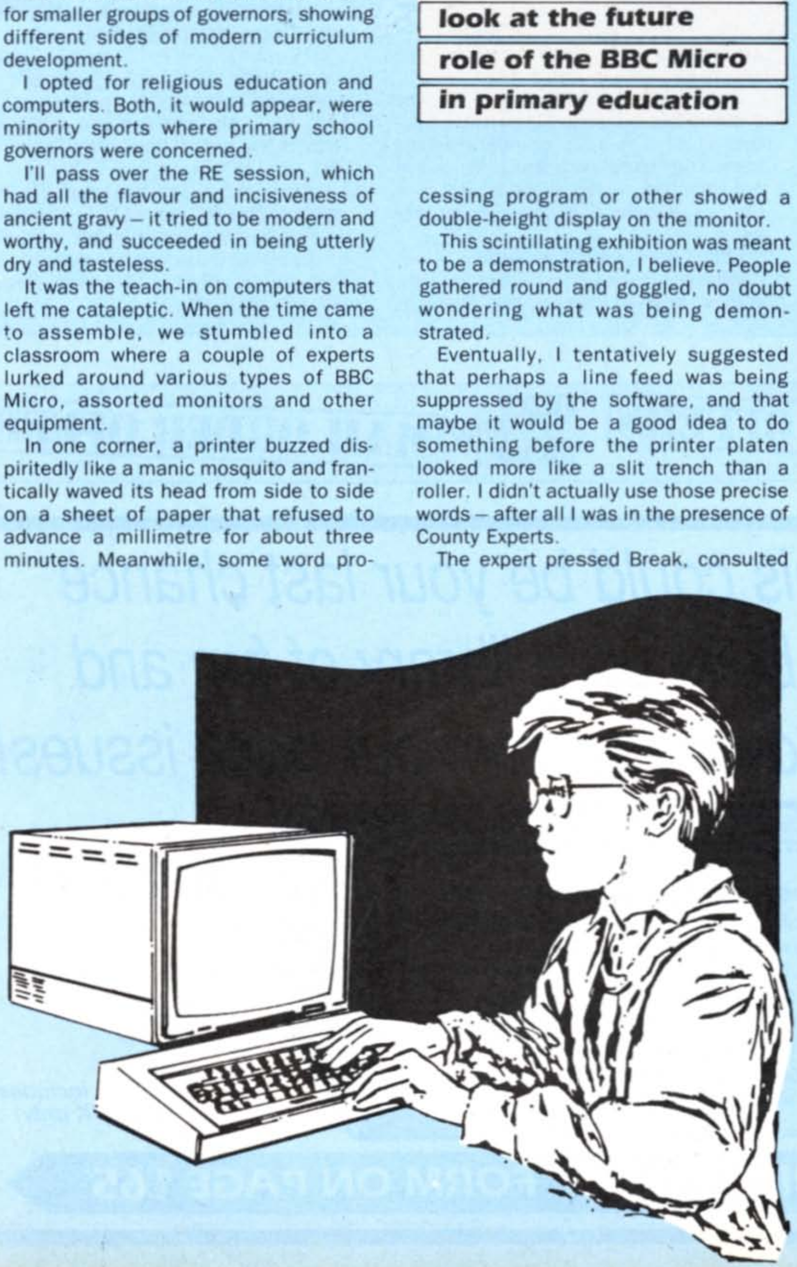
It was the teach-in on computers that left me cataleptic. When the time came to assemble, we stumbled into a classroom where a couple of experts lurked around various types of BBC Micro, assorted monitors and other equipment.

In one corner, a printer buzzed dispiritedly like a manic mosquito and frantically waved its head from side to side on a sheet of paper that refused to advance a millimetre for about three minutes. Meanwhile, some word processing program or other showed a double-height display on the monitor.

This scintillating exhibition was meant to be a demonstration, I believe. People gathered round and goggled, no doubt wondering what was being demonstrated.

Eventually, I tentatively suggested that perhaps a line feed was being suppressed by the software, and that maybe it would be a good idea to do something before the printer platen looked more like a slit trench than a roller. I didn't actually use those precise words – after all I was in the presence of County Experts.

The expert pressed Break, consulted with another expert and discovered that they were not quite sure what to do: Experimentation followed, and expertise conquered – the printer quit. Eventually, it was coaxed into performing a rough replica of what was originally intended.



We were then treated to a modest lecture on what the county policy on computers in the primary classroom was. Two computers per school as a minimum was the intended target, and this I inwardly applauded.

What turned me all peculiar was listening to what the aim of the County Experts seemed to be so far as primary teachers were concerned.

Not for them the delights of programming, however basic; not for them a simple understanding of what went on under the cream cover of the machine; not even (poor things) an introduction to where information technology was likely to take us all in the next decade or so.

Teachers, it appeared, were being drafted on courses to enable them to do the following (I may exaggerate the merest trifle): How to switch on a computer, monitor and disc drive; how to press Shift+Break; type CHAIN, *Run, or even *Exec.

All they were being taught was how to operate a computer and software at the simplest level, without any aquisition of the kind of expertise that an 11-year old with a home micro is likely to pick up automatically in a couple of weeks.

I started to wonder why, until I realised that teachers, in the primary sector at least, are terrified of information technology and don't really want to know.

I called to mind a primary headmaster of my acquaintance: Essentially, he was a technological luddite, petrified by these monstrous machines that threatened to invade his classrooms and disrupt his orderly existence. He has now been promoted to County Advisor status (not for computing).

I asked one of Her Majesty's Inspectors whether my supposition was correct – that the average primary teacher behaved like a rabbit confronted by a ferret once he or she was in the

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EDUCATION FEATURE

◄ *From Page 83*

presence of a computer. He agreed that it was so in his experience.

Nic Outterside, an educationalist who has occasionally contributed to *The Micro User*, told me that, as a teacher, he had been frightened of computers at first. What drove him to make a closer acquaintance was the realisation that his pupils were set fair to outstrip him in understanding them and their software.

Nic did what all good teachers should do: He bought himself one of the beasts and set about mastering it. If you like, professional pride was the spur to his action.

I asked a teacher at my younger son's school if he considered that I was exaggerating the problem: He thought not.

I believe we are in danger of surrounding computers with a totally false mystique in our primary classrooms at least. I can see situations where teachers regard themselves as high priests, rather than sorcerer's apprentices, and consequently they will erect barriers around the very computers they are supposed to make accessible.

Software will be evaluated on the grounds that program X is *educational* – that is of a morally or educationally improving nature – whereas program Y is not, perhaps on the grounds that it is fun, or is even a popular adventure game.

I don't think schools should be full of children playing the latest arcade games, or even zapping the aliens in Elite, but I do think there is a case for more freedom than appears to be allowed in some.

I certainly don't want every primary school to have its own resident machine code junkie on the staff, but I am profoundly disturbed by what I have (not) learned at my training day.

If this scenario is true, teachers will think that, at all costs, children ought to be kept away from those nasty computers whenever they can't be closely supervised. After all, they might not switch them on properly, or (worse still) might even do things with them that teacher can't.

Admittedly, I am painting a somewhat extreme picture to get my point over, but I do find this a nightmare situation reminiscent of Ray Bradbury's Farenheit 451.

If I am right, all that will happen is that young people will get hold of computers, do whatever they can with them and end up despising those who are meant to be their mentors. Would somebody please tell me I am wrong?

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TO ORDER TURN TO THE FORM ON PAGE 165

CALL fills some educational gaps

Gabriel Jacobs assesses a range of language learning software

I RECALL a television programme of the early sixties in which an English spy had to pass as a Turkish businessman. Starting from scratch, he was portrayed as spending two weeks in a language laboratory from which he emerged speaking flawless Turkish.

The popular conception of language labs embodied in that programme was the result of the excitement they generated when they first hit us. We were led to believe that with – what was then – hi-tech equipment, mastery of a foreign language could be instilled, somehow by osmosis, into anybody. We therefore thought we were about to produce a generation of linguistic whizz-kids ready to do business with foreigners on their own terms (to coin a phrase).

The reality has proven sadly different. Our schoolchildren do not speak foreign languages better than they did 25 years ago, and some teachers spend their lives fighting resistance to language lab work. The equipment is there and must be used, even though students are bored to tears by it.

We're now witnessing something of the same syndrome with computer-aided language learning (CALL). Schools and institutions of higher education have dug deep into their coffers to buy BBC Micros, and language teachers have fought hard to establish the right to use them as much as colleagues in departments of Computer Studies.

The theory is that the fascination children have for technological equipment can be channelled into language-learning avenues, and that CALL can do for writing foreign languages what the lab ought to have done for speaking them. It would seem we have not learnt by our mistakes, and the situation is aggravated in the case of CALL by a lack of quality software.

What's available?

CALL software can be broadly divided into three: Games, drills and substitution.

With a couple of notable exceptions, the available games are awful, and all the drills are tedious. Substitution offers possibilities, though it is hampered by the computer's lack of intelligence.

The problem is one of distinguishing between the right response and the nearly-right response. You can program a computer to accept as correct a response containing a typing error such as the transposition of two letters. But if you're trying to teach the rule *i before e except after c*, recieve is about as wrong as it can be.

The difficulties of writing a fool-proof interactive substitution program are horrendous, and CALL software – not surprisingly – tends to side-step them. The result is that the BBC Micro, for all its patient virtues, can be made to look silly in the eyes of the learner. And any teacher made to look silly has little hope of success.

Unilateral programs

THE suite of authoring CALL programs being marketed by Coventry Polytechnic belong to the substitution category.

They're reasonably well produced, and allow a language teacher considerable flexibility in creating exercises. But they fall into just about every trap when it comes to doing things which can make the computer look a fool. Despite clear efforts from the authors of the programs to keep users in mind, the Uni suite still leaves you with the impression of being too much on the side of the computer as opposed to that of the learner.

The core of the suite is **Unitext**, a rudimentary word processor used for creating texts to be read by the exercise modules. And, incidentally, rudimentary is the operative word – for instance, to reformat text you have to insert and delete spaces manually, line by line. It's enough to drive you to despair if you're used to View, Wordwise, Mini Office II or such like.

Still, you do have all accented characters at your disposal for French, Italian, Spanish and German, both on the screen and at the printer. And once you've been through the potentially painful process of entering text, you at least know that it's in the right form to be used by the other Uni routines.

Product: Unitext, Unifill, Unigap, Unisub
Prices: Unitext without printer driver £30; with FX series printer driver £40; with other printer drivers £40-£50.
Unifill, Unigap and Unisub £20 each. Discounts of between 50% and 75% are available for multiple copy licences.
Supplier: Department of Language Studies, Coventry Polytechnic, Priory Street, Coventry CV1 5FB
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Unifill takes your foreign-language text and blanks out every word. The student is then required to reconstruct it, working from a hard-copy English version. The complete foreign-language version (maximum 88 lines of 39 columns) can be viewed initially, and the program then asks for each word to be translated. If necessary the student can call up the first letter of a word as a cue, but loses marks for doing so.

The Uni scoring system operates by adding 10 marks to the total for each word correctly entered with no cue. If mistakes are made, incorrect characters are blanked out again. If the student puts these right, 5 marks are awarded instead of 10, but none are given for a third incorrect response. If you're forced at any time to re-view the complete text, 40 marks are deducted. The correct word is displayed at the end of all this.

I'm generally against scoring systems in CALL, but leaving that aside, the Unifill system is fair and works fine. The problem is the one about the teacher deciding what is and is not correct.

To take the simplest of examples, Unifill considers upper- and lower-case letters to be distinct entities. This is necessary for German nouns, but of less significance in French, Spanish or Italian. Suppose you head a Spanish text with the title DON QUIJOTE. If the student enters Don Quijote (the normal way of writing it), the program rejects it.

The same difficulties of accurate input arise with the other two modules.

Unigap takes a foreign-language text and blanks out individual words or sections which have been enclosed between angle-bracket delimiters. **Unisub** is meant primarily for testing and reinforcing grammatical structures. It displays the text with pre-selected words or phrases highlighted, and the student has to replace these according to rules devised by the teacher, for instance putting all verbs into the past tense.

Again, there's no mechanism for accepting more than one response as being correct. And while teacher-defined Help files can be be accessed at any time, these are no substitute for what is really required: An intelligent explan-

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ation automatically generated when there is any ambiguity.

To take a more subtle example than upper- and lower-case letters, imagine a student who has learned that the French for software is *le logiciel*, being informed categorically that this is wrong and *le software* is right. In fact both are correct, and both have the same number of blanked letters to be filled.

It could be argued that since texts created for use with these routines are meant to be read through by the student before attempting the substitutions, errors pointed out by the computer are real enough. But the Uni modules still typify the over-rigorous and paralysing logic of current CALL software.

Having said all that, it would be unfair not to emphasise that the higher up the educational ladder you go, the less important the perceived stupidity of the computer becomes. The Uni modules were developed for use in tertiary education, and are regularly used for teaching in Coventry Polytechnic, apparently with a good deal of success.

What is more, the enthusiasm of the human teacher is the most vital factor in any learning situation. And if our future teachers brought up on CALL software of this kind are so keen to use it themselves as a teaching aid that their enthusiasm is passed on to their students, we might just avoid the equivalent of the language lab fiasco. But, frankly, I doubt it.

Disappointing selection

Andrew Heaton on an educational compilation for school and home

FERNLEAF'S Educational Software Selection comes in three volumes, each offering five programs. They are marketed as not just educational but also for family pleasure, presumably aimed at the High Street market. Each volume comes in a sturdy plastic case and contains, as well as the disc, a flimsy monochrome manual which is small in print but easy to read.

First of all we'll look at volume one. **Fletcher's Castle**, set in Norman England, requires you to build a castle in 10 days or less, using soldiers and workers. How you, as the knight, do this depends on your strategy. You have a choice of sites, each with some advantage and problem. You must obtain food, guard from attack and prevent your workers from escaping. Your progress may be recorded on the worksheet provided.

Once you have decided on your strategy, it is implemented by allocating the necessary combinations of people to tasks to ensure they are successfully completed so the project may viably continue. Very dull you may think, but combined with poor graphics and a labourious way of entering your options does anyone ever get to filling in the record sheet – let alone build a castle.

Thorn Sea involves making a profit in the fishing industry. Aimed at the 8 to 12 age group, it presents you with a large amount of information in the manual. There is far too much to remember, so constant reference is essential. The child needs to have a working knowledge of coordinates and the 24-hour clock. On screen the grid is far too detailed, hence it is very difficult to discern what you are looking at.

The third game, **Treasure**, has a grid of 90 squares. When you choose a square it will change colour to red if you are on or next to the treasure, purple if you are within three squares or white if farther away.

Money Target uses a grid of only 40 squares and conventional coordinates. Each grid has a hidden value and you use this to gain your money target. You may preview the value of unused squares. The game has three levels depending on your ability to add.

The final game is **Perfume Hunter** which asks you to find some hidden bottles of perfume, lost in the long grass. A dog is available to help and by a system of deduction from on-screen information you must find the perfume and return the dog to the kennel before he gets angry. The grid is an unbelievable 100 squares and the dog resembles a big fly – difficult to see even when angry.

Volume two continues in a similar fashion: **Island Yacht Race** is reasonable but the graphics are poor. The arithmetical content of **Find the Question** is educational but the graphics are basic and therefore the program just hasn't any element of adventure or reward that would appeal to a child. The final game **Deliver the Message** returns to the eye-boggling grids again. It has three levels of the same task and you have to avoid guards and traps. The game is interesting to play but the simple use of the arrow key in place of coded letters would be an obvious improvement.

In volume three the first game, **The Bordar's Daughter,** returns us to Norman Britain. This time a soldier wants to marry Border's daughter and the plot is an exciting race to find her father. Secret codes are used by each team to move on the grid which is littered with numbers, arrows, crosses and huts.

The second program **Ferry Captain** requires you to make a profit running a ferry. You are given three sides of condensed written information for help. The game is just another variation of Thorn Sea. **Bridges** returns to a mathematical bias, with bridges being built by answering addition or subtraction questions at various levels. You can force your opponent to take a longer route by blocking if necessary. The game is reasonable but lacks the flair to sustain interest.

Market Stall involves simple money management and is good, mainly because the task is relevent. **Naming the Square** involves small groups of players deducing the colour of each square using on-screen clues. The grids increase from 9 to 20 squares depending on the level chosen. It is a reasonable application for the computer but educationally lacks foundation.

It is very difficult to enthuse about any of the programs offered in this selection. Some are downright poor and clearly stem from the 1982-84 period when the market was flooded with anything that could be called educational. If you were to use the games at home, as the manuals often suggest, you would need a photocopier to reproduce the record sheets. When playing the games far too much reference is made to the manuals, which spoils enjoyment and they also lack the quality to withstand such use.

While I have a duty not to be completely negative about these programs, I must say that by comparison there are much better ones available and as educational software they are very disappointing.

Program: Education Software Selection, Volumes 1-3.
Price: £24.95 each
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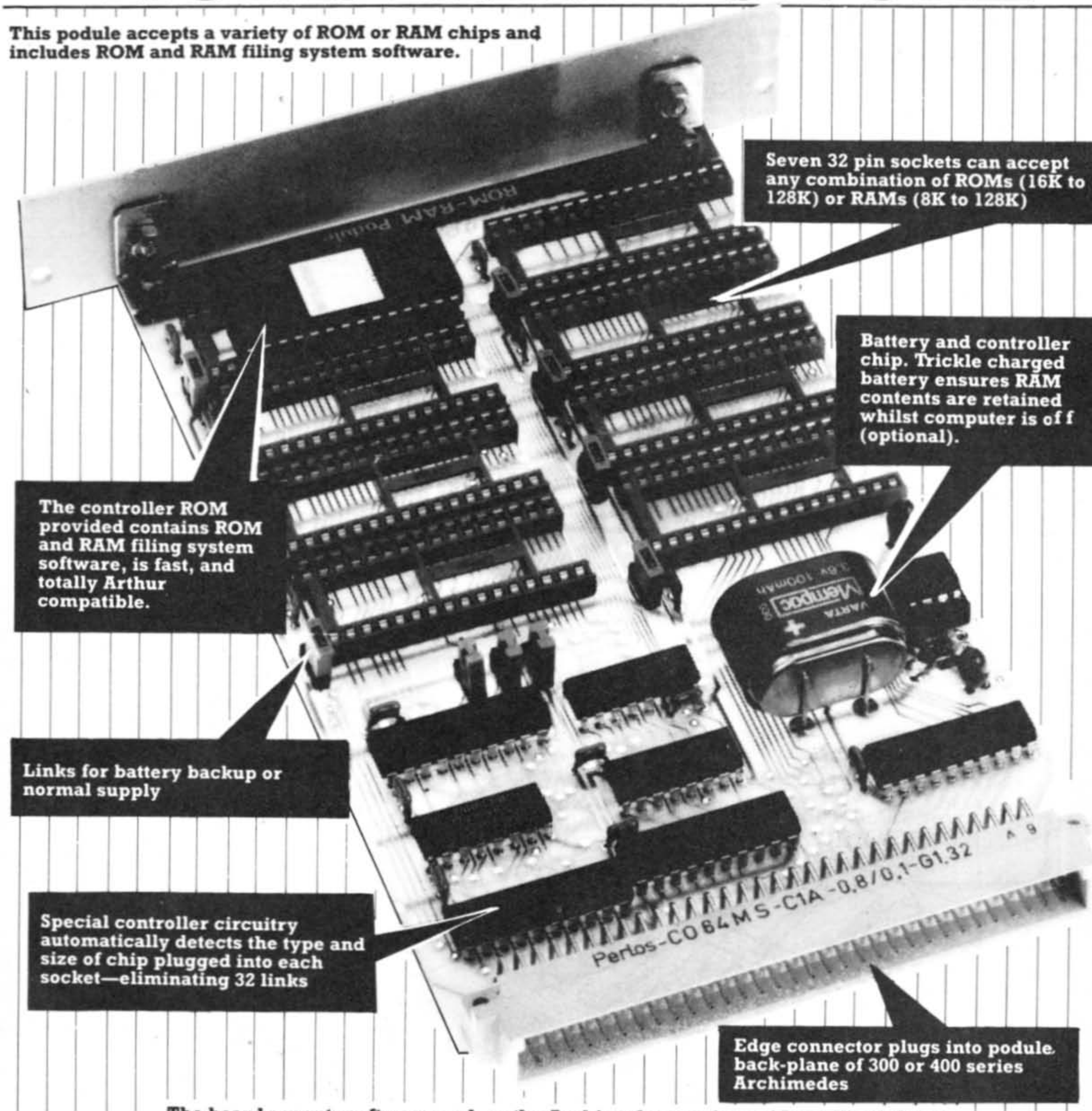

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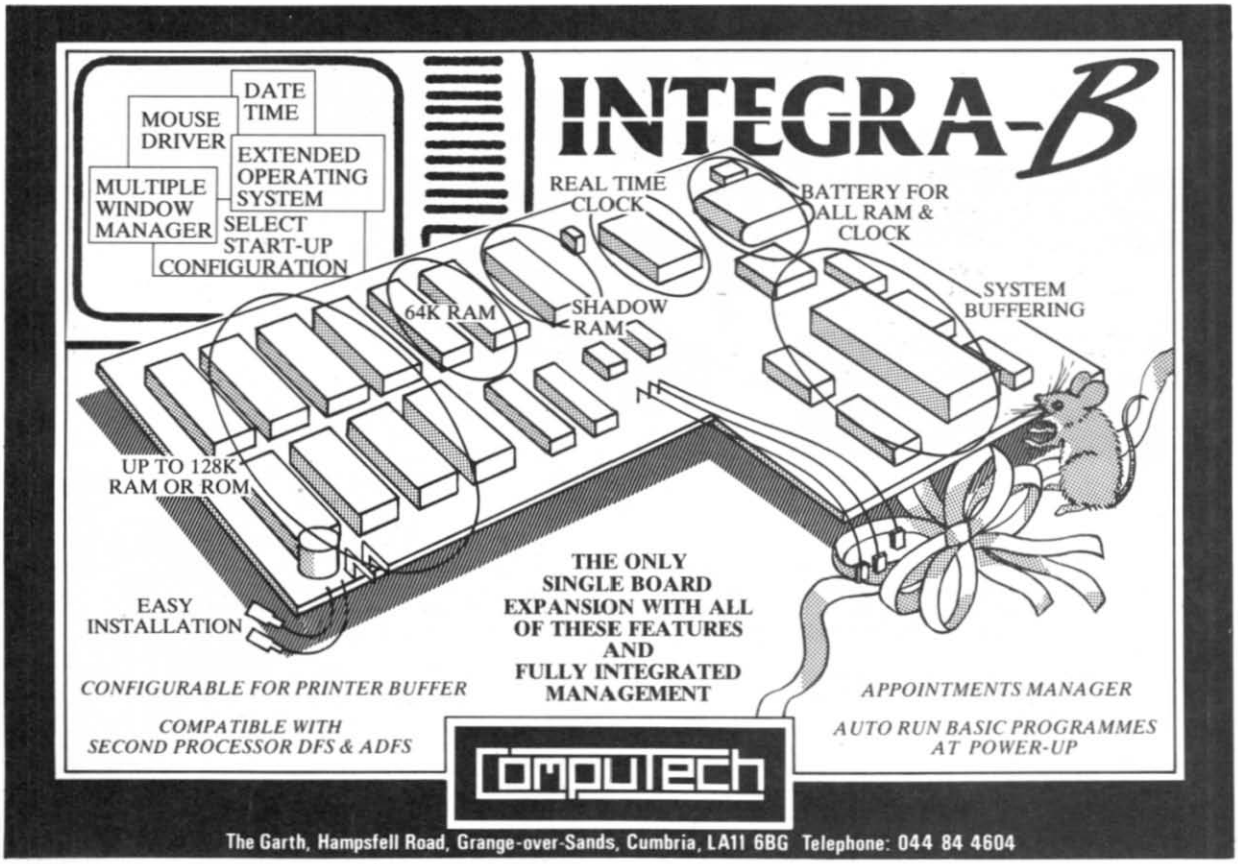

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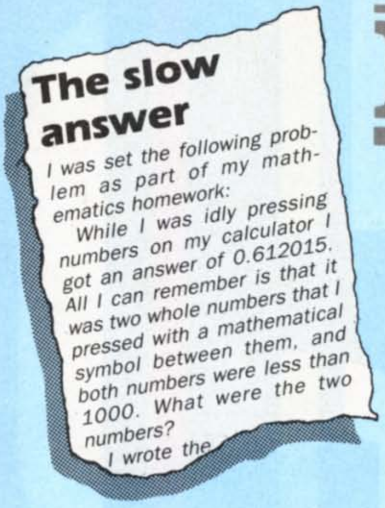
EDUCATION LETTERS

Number crunching

We shave seconds off a homework problem



The slow answer

I was set the following problem as part of my mathematics homework:

While I was idly pressing numbers on my calculator I got an answer of 0.612015. All I can remember is that it was two whole numbers that I pressed with a mathematical symbol between them, and both numbers were less than 1000. What were the two numbers?

I wrote the

IN the December issue of *The Micro User* we published a letter from Sarah Capper that challenged readers to find a speedier solution to her homework problem.

We had such a deluge of letters over the last couple of months offering speedier solutions and generally expressing interest in the problem, that we have brought them together this month in one feature to do them justice.

First off the mark is **Maurice Hodges, Dunstable, Beds** who writes:

*The problem that Sarah wishes to solve is: B%=0.612015*A%. Clearly B% is less than 1.0 * A%, but greater than 0.5 * A% so, to find the value of B%, it is unnecessary to search between the limits of 1 and 1000 each time. Instead, we can search between limits that are related to the value of A% currently being used.*

*In fact we can impose quite tight limits, say 0.6*A% and 0.625*A%. This means Sarah's second line can read:*

```
20 FOR B%=0.6*A% TO 0.625*A%
```

obtaining the result in under a minute and a half, which can be checked by adding the following lines:

```
  5 NOW=TIME
 90 PRINT"RESULT IS: ";A%"AND";B%
100 PRINT"TIME TAKEN: ";(TIME-NOW
)/100;"SECONDS"
```

● When we made the above additions the program took 84.71 seconds to find the right answer on a BBC B.

Next is a solution offered by **Peter Davy, Wakefield, West Yorkshire**:

This short program gives the correct answer to Sarah Capper's problem in about 12 seconds:

```
   10 MODE 7:TIME=0
   20 FOR B%=1 TO 1000
   30 A=B%*.612015
   40 A$=STR$(A)
   50 IF INSTR(A$,".000")<>0 OR INS
TR(A$,".999")<>0 GOTO 70
   60 NEXT
   70 PRINT INT(A+.5),B%
   80 PRINT"TIME TAKEN ";TIME/100;
   90 PRINT" SECONDS"
```

The program multiplies all the numbers from 1 to 1000 with 0.612015 and line 50 picks out the first suitable result.

Incidentally, I think it should have been stated that an eight digit calculator was used. If you divide 489 by 799 on a ten digit machine you get 0.612015019.

● Peter's program, by making ingenious use of the INSTR command, found the result in 12.19 seconds.

H.L. Smith, Little Bealings, Woodbridge had this to say:

It would appear from Sarah Capper's short (but incredibly slow) program that the mathematical manipulation she carried out was division.

If this is the case the largest possible value the numerator can have (with a denominator of 999) is 612.

Here's a more efficient program:

```
10 MODE 7:C=0.612015:E=0.000001
20 TIME=0:FOR X%=1 TO 612
30 Y%=X%/C:A=X%/Y%:D=C-A
40 IF E<ABS D NEXT:END
50 PRINT X%,Y%
60 PRINT "TIME TAKEN ";TIME/100;
70 PRINT " SECONDS"
```

● This program approaches the faster ones we have received. It took 3.99 seconds on a BBC B.

But a shade faster still was the routine from **Jonathan Trevor, Louth, Lincs**:

After reading the letter from Sarah Capper I wrote the following program:

```
 10 MODE7:A%=1000:B%=1000:C=0.612015
 20 INPUT "Error margin:"E
 30 IF E=0 E=0.0000001
 40 H=C+E:L=C-E
 50 TIME=0:REPEAT
 60 IF B%/A%>H B%=B%-1:UNTIL FALSE
 70 IF B%/A%<L A%=A%-1:UNTIL FALSE
 80 UNTIL TRUE
 90 T=TIME/100
100 PRINT "B=";B%;" A=";A%;
110 PRINT " in ";T;" seconds"
```

My program improves on the two hour one by using a simple algorithm. Small gains in speed could be made by using GOTOs instead of the REPEAT ... UNTIL loop, but would make the program messy.

I would be surprised if any reader could better this time drastically without using machine code.

● Yes, you've knocked half a second off Mr Smith's program with a neat piece of coding. It took 3.49 seconds. However, we still have further to go before needing machine code as **Christopher Murray, West Wickham, Kent** shows.

In reply to Sarah Capper's homework problem, I am pleased to submit an alternative solution further developing her approach.

*This shows a considerable time saving, although you might think that invoking the *FX16,0 to cut a further 0.03 seconds off the calculation time is going a bit far:*

```
   10 MODE 7:*FX16,0
   20 TIME=0
   30 FOR A%=612 TO 1 STEP -1
   40 B%=INT(A%/.612015)
   50 IF ABS(A%-.612015*B%)<.0001 G
OTO 70
   60 NEXT:NEXT
   70 PRINT A%,B%
   80 PRINT "TIME TAKEN ";TIME/100;
   90 PRINT " SECONDS"
```

● This was the fastest program we have received so far, taking only 1.89 seconds on a BBC B.

Thanks to everyone who sent in a solution; we've only had room for a small selection but they represent most of the different methods used.

Impressed though we were with Christopher Murray's solution, we thought we'd have a go ourselves. So we had a look at his program, added a couple of ideas of our own, and came up with the following:

```
 10 MODE 7:J=.612015:K=.001:*FX16
 20 TIME=0:FORA%=612TO1STEP-1
 30 B%=A%/J:IFA%-J*B%<K K%=A%:A%=0
 40 NEXT:END
 50 T=TIME/100
 60 PRINT "RESULT: ";K%;"/";B%;
 70 PRINT " = ";K%/B%
 80 PRINT
 90 PRINT "TIME TAKEN: ";T;
100 PRINT " SECONDS"
```

By replacing constants with variables, leaving out spaces between keywords, ignoring INT (when assigning a value to B% it will be integer anyway) and ABS (the result must be positive), and employing the *FX16 trick we've cut execution time down to 0.81 seconds – and we didn't jump out of the FOR...NEXT loop either.

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★ VIEWSHEET	~~£59.80~~	£45.00
★ VIEWSPELL	~~£39.95~~	£31.96
★ VIEWSTORE	~~£59.80~~	£45.00
★ VIEW INDEX	~~£14.95~~	£11.99

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Archimedes 305 Basic	£699 (a)
Archimedes 310M Basic	£835 (a)
Archimedes 410 Basic	£1,399 (a)
Archimedes 440	£2,299 (a)
Monochrome Monitor (incl. lead)	£50 (a)
Colour Monitor (incl. lead)	£195 (a)

ADD-ONS

0.5Mb Ram upgrade kit for 305	£79 (c)
2nd Floppy Drive	£125 (b)
Podule Backplane	£39 (c)
20 Mb Hard Disc + Podule	£499 (a)
I/O Podule	£79 (b)

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ISO Pascal	£99 (c)	Deltabase	£25 (c)
Fortran 77	£99 (c)	Minotaur	£11 (c)
Logistix View Professional	£99 (c)	Archimedes Ref Manual	£29.95 (b)
ZARCH	£17 (c)	ARM Ass Lang Prog	£12.95 (d)
Artisan	£34 (c)		
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SYSTEM 2 System 1 with a 12" Hi Res Monochrome Monitor.	£375 (a)
SYSTEM 3 System 1 with a 14" Med Res RGB Monitor.	£499 (a)
Second Drive Kit.	£95 (c)
Serial Kit.	£25 (c)
T.V. Modulator	£26 (d)
Extension cable for external 5.25" 80T Drive	£12.50 (d)
Mertec Adaptor (Upgrades to almost master level)	£35 (c)

FILE STORE

Acorn's new file server system Filestore E01	£828 (a)
Filestore E20	£710 (a)
Full details on request	
Acorn 30Mb Winchester (incl FS III Software)	£1530 (a)

ECONET ACCESSORIES

Econet Starter Kit	£85 (b)	Econet Bridge	£174 (b)
Econet Socket Set	£29 (c)	Printer Server Rom	£41 (d)
File Server Level II	£75 (b)	10 Station Lead Set	£26 (d)
Master FS Utility Disc	£17.25 (d)		

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ADC08 512 Processor			£189 (b)
ADF14 ROM Cartridge	£13(d)	ADJ22 Ref Manual I	£14(c)
ADF10 Econet Module	£41(c)	ADJ24 Adv Ref Manual	£19.50(c)
ADJ23 Ref Manual II	£14(c)		
BBC Master Dust Cover	£4.75(d)	View User Guide	£8.50(d)
		Viewsheet User Guide	£8.50(d)

MASTER ROM/RAM CARTRIDGES

TRC1 Two rom cartridge	£8.95 (d)
TRC4 Four rom cartridge	£11.95 (d)
TRC 32K Cartridge inc RAM	£29.95 (d)

UPGRADE KITS

1.2 OS ROM	£15 (d)	ADFS ROM	£26 (d)
DNFS ROM	£19 (d)	1770 DFS Kit	£43.50 (d)
BASIC II ROM	£22.50 (d)	Econet Kit	£55 (d)

SECOND PROCESSORS

Universal 2nd Processor Adaptor	£75 (b)
Acorn 65C02 Turbo	£99 (b)
ACORN 512 PROCESSOR	£189 (a)
MULTIFORM Z80 TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar + MS/DOS Read/Write Utility	£249 (b)

ACW/CO-PROCESSOR

32016 Co-processor	£949 (a)
Cambridge Workstation	£3450 (a)
X25 Gateway	£2175 (b)
10 MHz upgrade for Co-Proc	£255 (a)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. **£265 (a)**

EPROMS/RAMS

2764-25	£2.80 (d)
27128-25 (12.5V Vpp)	£3.40 (d)
27128-25 (21.0V Vpp)	£4.80 (d)
6264LP-15	£2.40 (d)
27256	£5.00 (d)
27512	£9.90 (d)

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2*8K RAMS	£37 (c)
ATPL Battery backup kit	£18 (d)
ATPL Board for BBC+	£31 (c)

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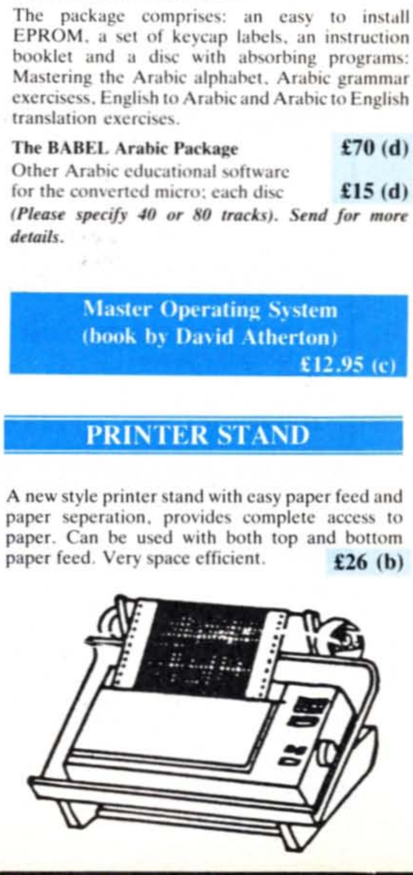

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TECHNOMATIC DISC DRIVES

TS 400

PD 800P

A range of high quality high performance drives to meet the needs of all BBC Micro Users.
All drives fitted with high quality, slim line Japanese drive mechanism and necessary cables.

*All drives are fitted with high quality slim line ultra low power mechanisms capable of single and double density operation and offering fast track access and head setting times. Our confidence in their quality enables us to offer a two year warranty on these mechanisms without any extra charge.

*5.25″ floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

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5.25″ Single Drives 40/80 switchable:

TS400 400K/640K	**£99 (b)**
PS400 400K/640K with integral mains power supply	**£109 (b)**

5.25″ Dual Drives 40/80 switchable:

TD800 800K/128OK	**£179 (a)**
PD800 800K/1280K with integral mains power supply	**£199 (a)**
PD800P 800K/1280K with integral mainspower supply and monitor stand	**£209 (a)**

3.5″ 80T DS Drives:

TS351 single 400K/640K	**£75 (b)**
PS351 single 400K/640K with integral mains power supply	**£99 (b)**
TD352 Dual 800K/1280K	**£129 (b)**
PD352 Dual 800K/1280K with integral mains power supply	**£169 (b)**
PD853 Combo Dual 5.25″/3.5″ drive with psu.	**£209 (a)**

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(Suitable for DFS & ADFS)

TDM2 Dual Unit: 2 computers/one drive unit	**£69 (b)**
TDM4 Quad Unit: 4 computers/one drive unit	**£119 (b)**

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Technomatic offer the most popular range of Winchester Drives for BBC Micro Systems at competitive prices.

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P40HD TECHNOMATIC 40 Mbyte Winchester Drive with Acorn ADFS ROM	**£749 (a)**
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TS10 10 Mbyte Tape Streamer Backup unit with utilities.	**£599 (a)**
TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10.	**£19 (d)**

Technomatic Winchesters can be adapted to operate with the SJ Research FileServer by internal modification. However this must be specified at the time of ordering, otherwise the drive has to be returned to us for modification.
Adaptor for SJ FileServer **£28**

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These units let you share a Winchester drive between a number of computers. Full details on request.

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Following the tremendous demand for our P20 HD Unit we are pleased to announce the launch of the P30 HD – a 30 MByte Hard Disc Unit including our WIMP software and the ADFS Rom if specified. £495 (a)

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746 80T SS DD	**£11.50 (d)**
747 80T DS DD	**£13.25 (d)**

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80T DS DD	**£19.50 (d)**

(Add £1 for library case packing)

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diskettes
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diskettes

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50 3.5″ 80 T double sided discs with sleeves in lockable box.	**£60 (b)**

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5.25″ Kit with 20 disposable discs	**£12.50 (d)**
3.5″ Kit with 20 disposable discs	**£14.00 (d)**

DISC STORAGE BOXES

DB340 Lockable 40 x 3.5″	**£8.50 (c)**
DB550 Lockable 50 x 5.25″	**£6.50 (c)**
DB570 Lockable 70 x 5.25″	**£8.50 (c)**
DB5100 Lockable 100 x 5.25″	**£10.50 (c)**

TECHNOMATIC

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305 Edgware Road, London W2 Tel: 01-723 0233

PRINTERS

EPSON LX800	£195 (a)
EPSON FX800 An enhanced version of FX85. Call for details.	£299 (a)
EPSON FX1000 An enhanced version of FX105. Call for details.	£405 (a)
EPSON EX800	£409 (a)
EPSON EX1000	£549 (a)
Colour option for EX800/EX1000.	£59 (b)
EPSON LQ850	£439 (a)
EPSON LQ1050 As LQ800 but wider carriage for 136 columns.	£529 (a)
TAXAN KP815 Enhanced KP810 with 160cps and full IBM compatibility.	£269 (a)
TAXAN KP915 Enhanced KP910 with 180cps and full IBM compatibility.	£369 (a)
National Panasonic KXP1081 Now supplied with a BBC printer lead and our WYSIWYG Rom. This rom provides one of the most powerful and versatile printer drivers for WP and BASIC. (see description elsewhere in the directory)	£149 (a)
STAR NL 10 (Parallel Interface)	£179 (a)
STAR NL 10 (Serial Interface)	£219 (a)
INTEGREX Multicolour Inkjet printer. Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics.	£549 (a)
BBC Screen dump for Integrex.	£15 (d)
BROTHER HR20 8K buffer standard expandable to 16K. Parallel & Serial ports as standard.	£349 (a)
NAT PANASONIC KX P3131 Daisy wheel printer with 38K buffer, 17 cps, bi-directional, parallel interface	£249 (a)
JUKI 6100 Daisy wheel printer 15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface.	£295 (a)
Parallel Printer Lead (1.2m)	£5 (d)

MODEMS

All modems listed below will be supplied with a BBC data lead.

MIRACLE WS4000 V21/23	£135 (b)
MIRACLE WS3000 V21/23	£244 (b)
MIRACLE WS3000 V22	£409 (b)
MIRACLE WS3000 V22 bis (All modems are BABT approved)	£537 (b)
BBC Data Cable for WS3000/4000	£7 (d)
MIRACLE WS2000V21/23 & BELL stds	£92 (c)
WS2000 Auto Dial Card	£27 (d)
WS2000 Auto Answer Card	£27 (d)
WS2000 SK1 Kit	£5 (d)
WS2000 User Port Lead	£5 (d)

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Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	£29 (d)

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Plotmate A4S	£282 (a)
Plotmate A3M	£431 (a)

Larger Plotters available. Please enquire.

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BUFFALO PB Buffer Parallel buffer for internal fitting to most Epson printers. Simple to instal. **PB128** (128K)	£89 (c)

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High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases, all lines fully switched.

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2 Computers to 1 Printer 36v36-2	£25(c)	25v25-2	£25(c)
3 Computers to 1 Printer 36v36-3	£39(c)	25v25-3	£39(c)
4 Computers to 1 Printer 36v36-4	£45(c)	25v25-4	£45(c)
2 Computers 2 Printers X-over 36v36-x	£49(c)	25v25-x	£49(c)
BBC Cable set 3 to 1 (1m ea)	£24(c)		
BBC Cable set 4 to 1 (1m ea)	£30(c)		

BBC Computer Sharer: TCS26 1 computer to 2 printers fitted with BBC cable	£21 (c)

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PROGRAMMING ACCESSORIES/SOFTWARE

Compatible with B, B+ and Master

EpromRyter (Epromer II) Eprom Ryter is compatible with BBC Master only. See page 7.	£89 (b)
Upgrade of Epromer II to Eprom Ryter (Please return your Epromer II)	£49 (b)
EPROMER II	£89 (b)
MPROMER	£49 (c)
META ASSEMBLER	£145 (b)
PORTAL EPROM EMULATOR 512K	£245(b)
TEAM Disassembler	£145 (b)

EPROM ERASERS

UV1B 6 eproms, safety cutout	£47 (b)
UV1T 6 eproms, timer, safety cutout	£59 (b)

MONITORS

BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	£179 (a)
Microvitec 1431AP As 1431 + composite video and sound input	£199 (a)
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Microvitec 1451AP As 1451 + composite video and sound input	£255 (a)
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Microvitec 2030CS Standard Resolution RGB/Comp Video	£380 (a)
Microvitec 2040CS High Resolution RGB/Comp Video	£685 (a)
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	£239 (b)
TAXAN SUPER VISION 620 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	£269 (a)
TAXAN SUPER VISION 625 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	£319 (a)

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TAXAN KX 117 Hi Res green etched screen	£85 (a)
TAXAN KX 118 Hi Res Long Persistence (P39)	£90 (a)
TAXAN KX 119 Hi Res amber etched screen	£90 (a)
PHILIPS BM 7502 Hi Res green screen.	£69 (a)
PHILIPS BM7522 Hi Res amber screen.	£75 (a)
PHILIPS BM 7542 Hi Res White screen.	£79 (a)

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors)	£17 (c)
Philips Swivel Base	£10 (c)
Monitor Stand Models B & B+	£10 (c)
Monitor Stand Master	£13 (c)
Double Tier stand Models B, B+ or Master	£24 (b)
Taxan RGB Lead	£5 (d)
Microvitec Lead	£3.50 (d)
Monochrome BNC/Phono Lead	£3.50 (d)

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CAD/DRAWING PACKAGES

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Cad Package for B, B & MASTER.
(See page 5 for specification)

Tracker Ball/Mouse Version (TM)	£49 (d)
TM Version plus Tracker Ball	£94 (d)
TM Version plus Mouse	£79 (d)
Plotter Driver Generator	£15 (d)

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AMX MOUSE with SUPER ART (pse specify B, B+ or Master)	£59 (d)
STOP PRESS (Pagemaker)	£32 (d)
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MAX	£17 (d)
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Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR	£35 (d)

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STARdataBASE	£39 (d)
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ACORN OVERVIEW PACKAGE Special Offer (RRP £86)	£69 (b)

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VIEW 3.0	£48 (c)
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For B & B+ 40T or 80T	£14.75 (d)
For Master 80T	£17.30 (d)
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MINI OFFICE II ROM Version

For Master, Compact, B+ & B	£48 (c)

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ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£39 (d)
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SLEUTH	£23 (d)
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TOOLBOX 2 (BBC Pub) Manual	£9.50 (d)
Cassette	£9 (d)
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PRINTMASTER	£24 (d)
PRINTWISE	£24 (d)
DUMPMASTER	£26 (d)
FONTWISE PLUS	£17 (d)
HERSHEY FONT CHARACTER GENERATOR	£18 (d)
ICON MASTER	£29 (d)
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RAMROD	£37 (d)
BROM PLUS	£32 (d)
MACROM	£37 (d)
BETABASE	£27 (d)
WHITE KNIGHT MKII	£16 (d)
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	Book	£5.25 (d)
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DEUTSCH DIREKT	Disc/aud/EC	£16 (c)
	Book	£5.95 (d)
MODEM MASTER		£11 (d)

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

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Acorn FORTH	£7.50
Acorn LISP	£7.50
Acorn ISO Pascal Ref Manual	£10.00
Intro to COMAL	£10.00
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Interfacing Proj for BBC	£6.95
BBC and Small Business	£5.75
The Software Business	£5.50

Mastering Operating System (David Atherton) £12.95

WYSIWYG PLUS

WYSIWYG PLUS is a printer and screen utility for Wordwise Plus, View, Interword, and Basic users, supplied on a 16K Eprom. To obtain a particular printer effect, such as enlarged text, it used to be necessary to discover the appropriate 'printer control code' from your manual and incorporate it into your text. Secondly, you had to print several trial copies in order to position the effect correctly in relation to the rest of your text.

WYSIWYG PLUS simplifies this trial and error approach using easily remembered *commands. For example, *ENLARGED not only selects enlarged text on your printer, but uniquely shows you double width characters on your screen, even from within Wordwise Plus!

WYSIWYG PLUS incorporates a logo editor. Just draw your design on screen using the arrow keys, and save the results. Use the *GRAPHICS command to incorporate your design anywhere in your text; position and see your design in your text before faithfully reproducing a hard copy.

There is also special help for daisy wheel users. The *WHEEL command will prompt you to change daisy wheels whenever a change in type style is about to occur.

WYSIWYG PLUS is designed to work with the following systems:

BBC Model B
BBC Model B+
BBC Master 128
BBC Compact

6502 Second processor,
Turbo coprocessor
All printers (Except lasers)

WYSIWYG PLUS workspace is relocatable.

WINDOWMATIC

All users of Acorn's VIEWSHEET speadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in up to 10 seperate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of rectifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOWMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.

The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.

WINDOWMATIC is compatible with BBC Master and BBC B+. A 6502 2nd processor must be fitted to a model B to run Windowmatic. Windowmatic is fully compatible with Turbo and 6502 2nd processor.

The program is supplied on disc with a comprehensive manual.

VU-TYPE

Do you have finger trouble when typing?
Do your letters look like this?

```
Dear Sor,
I wuold like to .....
```

then you need:

VU-type, a complete touch typing program produced by BBC/Pitman.

It allows you to learn at your own pace and has a wide range of exercises. Screen displays show the keys you have pressed and it will report on your speed and accuracy.

Supplied on a 40T Disc with a manual.

Available at a special price of £7.50(d) instead of the usual £15. Offer valid while stocks last

EDUCATIONAL/FUN SOFTWARE BUNDLE

Wordmover
Wordplay
Pantry Antics
Drawstick
Locomotion

These programs are supplied from the BBC Publications Educational Software range and will be supplied on a 5.25" disc for BBC Master, B+ and B and on a 3.5" disc for the Compact.

5.25" Disc	**£17.50(d)**
3.5" Disc	**£18.50(d)**

(Normal RRP over £40)

PRINTER ACCESSORIES

EPSON ACCESSORIES:

Interfaces

8143 RS232	**£30 (d)**
8148 + RS232 + 8k	**£65 (d)**
8177P NLQ for FX80 +/FX100 +	**£99 (d)**

Parallel & Serial Buffers of various size also available.

LQ800 Tractor Feed	**£47 (b)**
LQ1000 Tractor Feed	**£52 (b)**

SHEET FEEDERS:

LQ800	**£135 (b)**
LQ1000	**£179 (b)**
EX800	**£135 (b)**
EX1000	**£309 (b)**
FX800	**£135 (b)**
FX1000	**£179 (b)**

Ribbons:

RX/FX100/100 +, FX105	**£7 (d)**
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LX80/LX800	**£4.50 (d)**
LQ800	**£8.50 (d)**
LQ1000	**£10 (d)**
EX800/1000	**£7.50 (d)**
H180 Pen Set (Aqueous/Ball point)	**£8.25 (d)**

HITACHI 672 Plotter

Aqueous Pen Set six pens	**£18.50 (d)**
Oil Based Pen Set six pens	**£25.00 (d)**

TAXAN CANON Accessories:

Ribbon, KP810/815/910/915	**£6 (d)**

Star Printer

NL10 Sheet Feeder	**£52 (b)**
NL10 Ribbon	**£4.50 (d)**

National Panasonic KX P1080/81

Spare Ribbon	**£4.50 (d)**
KXP3131 Tractor	**£90 (a)**
KXP3131 Sheet Feeder	**£189 (a)**

JUKI 6100

Tractor Feed	**£149 (a)**
Ribbon (Carbon)	**£2.00 (d)**
Sheet Feeder	**£219 (a)**

BROTHER HR20

Tractor Feed	**£116 (a)**
Spare Ribbon Nylon	**£3.00 (d)**
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INTEGREX INK JET COLOUR PRINTER

Spare Ink Cartridge Black	**£9 (d)**
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Printer Leads:

BBC Parallel Lead (1.2m)	**£6 (d)**

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NOVACAD

Computer Aided Draughting for the BBC Micro

> “*Novacad can drive a plotter to provide drawings of a high quality … Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use.*” **Beebug December 1986**

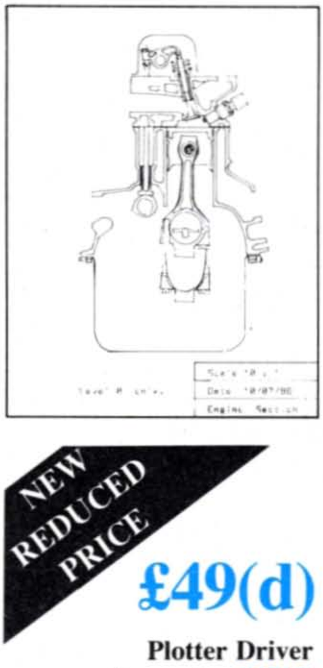
> “*Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market".*” **A&B Computing August 1986**

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

NOVACAD'S MAJOR FEATURES

- Simple and easy to use with logical command sequence.
- A large drawing area (approx 15 screens).
- The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
- A zoom facility allowing magnification of up to 20 times to insert finer details.
- Block copy of shapes on the screen for repetitive use.
- Text entry at any 90° orientation at any position on the screen.
- Create multi layer drawing with 8 levels available.
- Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
- Printer routine for Epson 80 and 136 column printers.
- A unique optional facility to output to any BBC compatible plotter.
- Cursor control from keyboard, tracker ball or mouse.



NEW REDUCED PRICE

£49(d)

Plotter Driver Generator £15(d)

NOVACAD is compatible with all BBC models fitted with Acorn DFS. It has minimum hardware requirements of a single drive and a Epson compatible printer to get started though NOVACAD will utilise fully a dual drive system and 6502 2nd processor or the shadow ram on the B+ series. To obtain high quality drawings we recommend a BBC compatible plotter and our plotter driver generator.

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

BBC SPARE PARTS

BBC B & General	
Power Supply	**£52.00 (b)**
Keyboard Connector	**£5.00 (d)**
Complete Keyboard	**£52.00 (b)**
Keyswitch (state type)	**£1.75 (d)**
Modulator UM1233	**£4.80 (d)**
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1770 DFS ROM	**£17.50 (d)**
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Keyboard	**£65.00 (b)**
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65SC12	**£15.66 (d)**
50464	**£3.50 (d)**
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9637	**£2.00 (d)**
32.768 MHz Xtal	**£2.00 (d)**
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ULA (512)	**£34.00 (d)**
ULA (6502 & Z80)	**£28.00 (d)**
Power Supply	**£42.00 (b)**

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EpromRyter

*Highly sophisticated & Advanced Programmer
*Handles all current single rail Eproms
*State of the Art Programming Algorithms

EpromRyter is a powerful eprom programmer designed for use with the BBC Master Computer. It takes full advantage of the latest developments in the eprom technology and the extra facilities on the Master to provide fast, simple and efficient programming and editing facilities.

The software is totally menu driven and on screen help messages make the programming simple for both specialists and novices alike.

The EPROMRYTER interfaces with the Master through 1 MHz bus. It is mains powered with its own psu. 3M Textool zif socket has been fitted to ensure consistent and reliable service over long periods.

NEW LOW PRICE £89 + VAT

The single rail eproms handled by the EpromRyter are:
- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

EpromRyter

The main features of the programming software are:
* Device, function and voltage selection from the computer keyboard.
* Continuous display of the options selected.
* All eproms upto 27512 (64K) programmed in single pass.
* Automatic Intelligent identifier support for eproms able to respond.
* Selectable programming voltage 25/21/12.5V
* 3 programming methods: Normal, Intelligent & Pulse (30 sec for a 27128).
* Serial port protocols **supported incl Intel Hex & Motorola S.**
* DFS, NFS, ADFS and Rom Filing System Supported.
* BASIC/Machine Code programming using RFS.
* Powerful editor with input in HEX or ASCII. * Full editable 64K file.
* Block move of data within the address range.
* User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
* Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER II

A proven Eprom programmer for BBC Model B and B+ with thousands in use in industry, educational and R&D establishments. It offers many of the powerful features of the EpromRyter and can program all single rail eproms upto 27256. Full details on request.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach."
Acorn User October 1986

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc):

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

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- 180 cps
- Friction feed and adjustable tractor are standard
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- Graphics capabilities

EPSON LX-800

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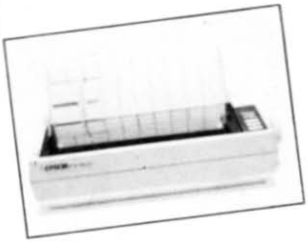

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HEAD COACH v3

At Coda Software we believe we have created the most challenging and realistic computer simulation of American Football that is currently available. "HEAD COACH v3" is a direct simulation of the National Football League and offers you the opportunity to coach a team in the world's toughest league. Here are some of the features.

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- "Excellent" – S. H. Northants
- "I am now addicted to the game" – R. C. Lincs
- "Superb" – N. E. Essex
- "Software and presentation are excellent" – D. F. Bushey

The Database of players and information on all teams which makes "HEAD COACH v3" so realistic, can easily be altered by the user if and when necessary to keep the game fully up to date. However, as a service to all new CODA SOFTWARE customers, we are offering regular information updates FREE OF CHARGE.

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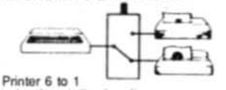
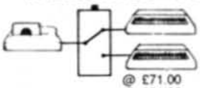
SWITCHING UNITS:

1 MICRO INTO 2 PRINTERS



1 PRINTER INTO 2 MICROS



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Centronics 4 to 1 (Inc Lead)	@ £70.00	£80.50d
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Centronics 4 to 1 Automatic Switcher	@£102.00	£117.30d
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Mike Cook provides a routine to produce shades of grey from digitised pictures

ALL OF A DITHER

THE BEEB BODY BUILDING COURSE

HAVE you got a video digitiser? And do you want to extend its flexibility? Have you got a really good picture but in the wrong mode for your page layout program? Well read on and you'll see that dithering about can pay off.

In the May issue of *The Micro User* I showed how to construct a video digitiser which is still available through the order form. It works in Mode 2 and gives a grey scale resolution of three bits per pixel, or eight shades.

This is fine when you want to look at a picture on the screen, but can be tricky when you want to get a hard copy or display it in one of the other screen modes which give fewer colours.

The problem is that most printers will produce either a single dot or no dot at all, creating a picture made up of just black and white. We say this is a bi-level display as there are only two levels of intensity. A Mode 0 screen is also a bi-level display, so representing different shades with such a system requires a little trickery.

The conventional way of achieving this, used in many screen dump routines, is to represent each pixel by a small matrix of printed dots. The more dots we print, the deeper the overall intensity appears.

This is all very well but it does require that the bi-level display has a greater resolution than the original image. If we are converting from a Mode 2 screen to Mode 1 we have twice as many pixels horizontally, but the same number vertically. Also, the arrangements used to generate the grey cells can produce large-scale patterning over the whole of the image.

So how can you tackle this problem if the resolution of the bi-level display is the same, or not much bigger, than the original image?

One answer is by using a threshold. Simply pick a value somewhere in the grey scale, and if the image pixel is above this value, then make the corresponding display pixel white, otherwise make it black.

What you will end up with is a pure black and white display without shades of grey. The contrast of the resultant picture will therefore depend upon the threshold value you used. This is known as a fixed dither, as you are always dith-

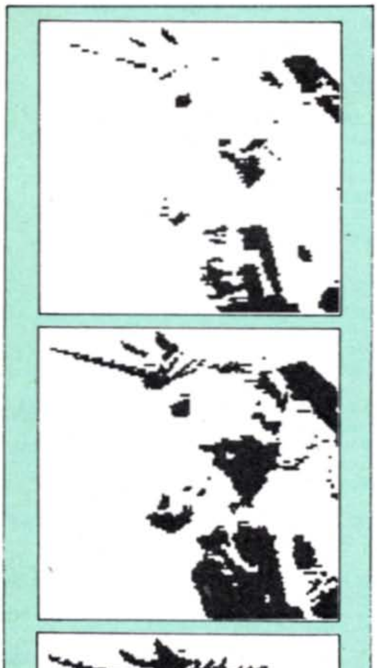

Figure Ia: Variations on fixed dither

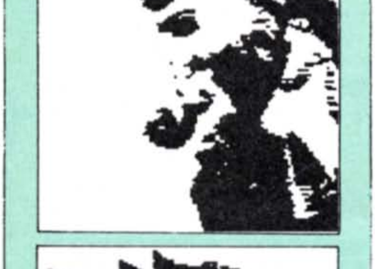

Figure Ib: Random dither

4X4 matrix Ordered Dither

$$\begin{bmatrix} 0 & 8 & 2 & 10 \\ 12 & 4 & 14 & 6 \\ 3 & 11 & 1 & 9 \\ 15 & 7 & 13 & 5 \end{bmatrix}$$

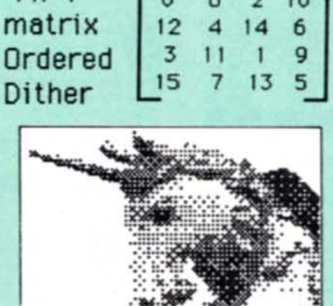

Figure Ic

Floyd Steinberg error distribution

E→ ↓↘	$\frac{3}{8}$
$\frac{3}{8}$	$\frac{1}{4}$

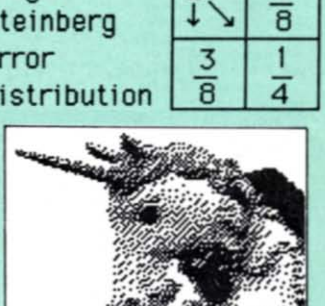

Figure Id

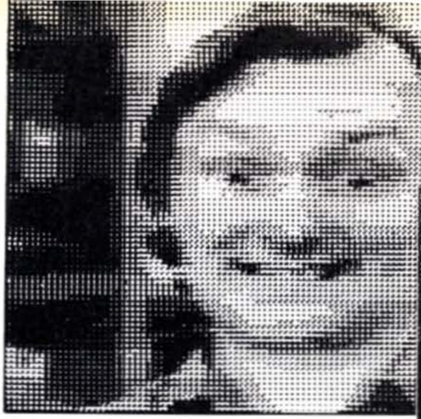

Figure IIa: Ordered dither

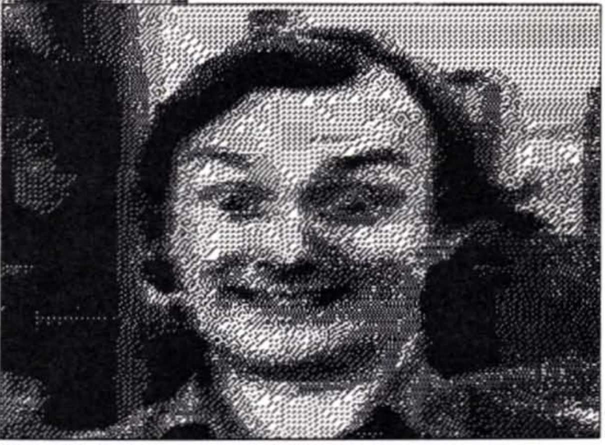

Figure IIb: Error distribution

ering about a fixed value. The result can be seen in Figure Ia.

To get better results, don't pick a fixed threshold but choose one at random for each different pixel. This is known as a random dither, and may not seem at first sight to be a good strategy, but the laws of probability will see you through.

Imagine that a large area of your image contains a single shade of the mid-value grey. A random threshold will be greater than the pixel value roughly half the time, and half the time less. This results in an area where only half the dots are printed, giving the overall impression of a grey area.

The higher the image pixel value, the greater the chance of a white point being displayed. This results in a picture that is much better than fixed dither but can produce a grainy result, as seen in Figure Ib.

To improve things further you can use an ordered dither, where the threshold for a particular point is obtained from a table of values. This table, or dither matrix, contains at least one entry for each shade in the original image.

Just like the random dither, the higher the image intensity, the higher the chance of any one display point being white. However you do not have the random element in the equation, so the picture appears less grainy and a little more patterned. The results can be quite good, as you can see in Figure Ic.

For the best possible results, you need to use a technique that preserves all the information in the image. By taking a threshold you are in effect throwing away some information. It does not matter how much above or below the threshold the original pixel was – that is the end of the story.

However, suppose pure white corresponds to a value of 15 and your image pixel has a value of 10. This is greater than the threshold value of eight so you print a white dot. But this pixel is not as bright as a full dot so there is an error in our display of 15 – 10 = 5 units of brightness.

What we need to do is to distribuite this error to the pixels close by to reduce

Turn to Page 102 ►

Program I

```
   10 REM Digitised Screen Converter
   20 REM by Mike Cook
   30 MODE7
   40 PRINT"BEEB BODY BUILDING COURSE"
   50 PRINT"MODE 2 TO MODE 1 SCREEN CONV
ERTER"
   60 PRINT"By Mike Cook"
   70 INPUT TAB(0,6);"INPUT NAME OF FILE
 TO CONVERT";F$
   80 PRINT
   90 PRINT"MODE 1 SCREEN WILL BE SAVED
AS 1.";F$
  100 INPUT TAB(0,13);"DITHER OR ERROR D
ISTRIBUTION D/E ";T$
  110 IF NOT(T$="E" OR T$="D") THEN GOTO"
 100
  120 DIM I1%(320),I2%(320),LK%(31),DM%(
2,2),LB% 1279
  130 PROC_ILOOK
  140 F%=OPENIN(F$)
  150 MODE1
  160 VDU 23,1,0;0;0;0;
  170 IF T$="D" THEN PROC_DITHER ELSE PR
OC_FS
  180 CLOSE#F%
  190 $LB%="SAVE 1."+F$+" FFFF3000 FFFF8
000"
  200 X%=LB% MOD 256
  210 Y%=LB% DIV 256
  220 CALL &FFF7
  230 END
  240 DEF PROC_FS
  250 N%=0
  260 PROC_RLINE
  270 PROC_TLINE(0)
  280 FOR L%=0 TO 254
  290 FOR T%=0 TO 319
  300 I1%(T%)=I2%(T%)
  310 NEXT
  320 N%=N%+1
  330 IF N%=8 THEN N%=0:PROC_RLINE
  340 PROC_TLINE(N%)
  350 FOR T%=0 TO 319
  360 IF I1%(T%)>3 THEN PLOT 69,(T%*4),1
023-(L%*4):DOT%=TRUE ELSE DOT%=FALSE
  370 IF DOT% THEN ER%=I1%(T%)-7 ELSE ER
%=I1%(T%)
  380 I1%(T%+1)=I1%(T%+1)+3*(ER%/8)
  390 I2%(T%)=I2%(T%)+3*(ER%/8)
  400 I2%(T%+1)=I2%(T%+1)+(ER%/4)
  410 NEXT
  420 NEXT
  430 ENDPROC
  440 DEF PROC_RLINE
  450 FOR S%=0 TO 639
  460 A%=BGET#F%
  470 ?(LB%+S%)=A%
  480 NEXT
  490 ENDPROC
  500 DEF PROC_TLINE(N%)
  510 LOCAL A%,P%
  520 P%=LB%-8
  530 FOR S%=0 TO 316 STEP 4
  540 P%=P%+8
  550 A%=?(P%+N%)
  560 I2%(S%)=LK%((A% DIV 2 )AND &15)
  570 I2%(S%+1)=I2%(S%)
  580 I2%(S%+2)=LK%(A% AND &15)
  590 I2%(S%+3)=I2%(S%+2)
  600 NEXT
  610 ENDPROC
  620 REM PIXEL TO NUMBER LOOKUP TABLE
  630 DATA 0,0,1,1,4,2,5,3,16,4,17,5,20,
6,21,7
  640 REM DITHER MATRIX
  650 DATA 3,2,6,2,0,5,1,7,4
  660 DEF PROC_ILOOK
  670 FOR A%=0 TO 31
  680 LK%(A%)=0
  690 NEXT
  700 FOR A%=1 TO 8
  710 READ P%,V%
  720 LK%(P%)=V%
  730 NEXT
  740 RESTORE 650
  750 FOR A%=0 TO 2
  760 FOR B%=0 TO 2
  770 READ DM%(A%,B%)
  780 NEXT
  790 NEXT
  800 ENDPROC
  810 DEF PROC_DITHER
  820 X%=-1:Y%=-1
  830 N%=-1
  840 PROC_RLINE
  850 FOR L%=0 TO 254
  860 Y%=Y%+1
  870 IF Y%=3 THEN Y%=0
  880 N%=N%+1
  890 IF N%=8 THEN N%=0:PROC_RLINE
  900 PROC_TLINE(N%)
  910 FOR T%=0 TO 319
  920 X%=X%+1
  930 IF X%=3 THEN X%=0
  940 IF I2%(T%)>DM%(X%,Y%) THEN PLOT 69
(T%*4),1023-(L%*4)
  950 NEXT
  960 NEXT
  970 ENDPROC
```

◀ *From Page 101*

the chance of those also being above the threshold, and so get closer to the true intensity.

One way of doing this is with the Floyd-Steinberg algorithm, which distrbutes the error to three adjacent pixels 3/8 to the right and below and 1/4 diagonally below and to the right.

This pattern of error distribution means that we can scan an image from top to bottom without needing two buffers or requiring any back tracking. As the image data is preserved it produces the best results yet, as seen in Figure Id.

The pictures in Figure I were produced from an image with 128 by 128 resolution and 16 levels of grey. The results were printed on a dot matrix printer – with each dot representing one pixel – which produces a small image of quite good quality. On the screen it will not look quite as good as the individual pixels are larger.

Program I will convert a Mode 2 screen image stored on disc, into a bi-level Mode 1 screen using either an ordered dither or error distribution. This is compatible with the Body Build digitiser or any other that uses eight grey shades. If you have an image that uses more than this you can easily change the dither matrix. It is a little tight on memory so you will have to remove any roms that claim work space.

Alternatively you can split Program I into two programs that handle only one technique each. The program may be easily changed to produce a Mode 0 screen but it will take a little longer to run.

As a screen dump file does not have the pixels in a conventional order, we have to do a little juggling about first. It takes rather a long time to convert using a simple model B – 12 minutes for an ordered dither and about 45 minutes for the error distribution.

It runs much faster with a second processor or on an Archimedes, but the line at the end that saves the new screen will have to be changed to suit the different machines. Figure II shows the results obtained using the Body Build digitiser. Bi-level images are never an improvement on the original, but when printed small can still look quite good.

● *After this month's article I'll bet you are all in a dither about next month's, so see you then.*

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Examine your routines in detail with Ray Wilson's powerful utility

Basic program gazetteer

SOMETIMES the number of procedures, functions and variables involved in a program can make it difficult to keep track of which part does what, where variables are initialised and what they mean.

It would be useful to have a utility to examine a program and document it by listing the variables used and producing a sort of dictionary of the program.

A geographical dictionary is called a gazetteer and since what is really needed is a map to help you explore your programs here's a routine called Gazeter. It is a speedy machine code utility that lets you *GAZE at any Basic program and produces a gazette on screen, printer or disc.

Now you can keep track of those seldom used variables and what the procedures and functions do without having to read every line of a program listing.

Type in the program carefully and once you've checked it using Get it Right! save it using the filename Gazeter. Then run it and the machine code will be saved as GAZE.

Printer output can be selected by answering Yes at the start prompt. You can also spool the output to disc by typing *GAZE *filename* so that you can document the result later using a word processor.

When run, the program makes an operating system call to test whether a filename follows the *GAZE command and if so it opens the file ready for spooling.

Basic programs start at PAGE and if the first byte isn't a Return, &0D, it isn't Basic. So Gazeter checks these before starting work on your file.

It then scans the program line by line and statement by statement extracting variable, procedure and function names. When a new name is found it is stored along with its line number.

At the end of a subroutine or, more precisely, when the DEF of the next procedure or function is found, the names that have been stored are displayed and the storage location is cleared ready for the next scan.

The end of program marker &FF, which immediately follows the Return at the end of the last line of a program, terminates gazetting and closes any spooled output file.

Programs with TOP higher than about &7000 would probably not have enough room for all their variables, so memory from &7000 to &7BFF is assumed to be unused.

In Basic, no line and therefore no single statement, can be longer than 240 characters, so &100 bytes are reserved as a buffer, *v–buff*, for variable names extracted from arithmetic statements that use lots of open and close brackets.

With Gazeter's machine code starting at &7000 and occupying half the available space between that and &7BFF, there is room for up to 200 variable names in a subroutine. However, if your programs have even as many as 100 variable names in a procedure then you shouldn't write such long routines.

Listing routines and their contents separately leads to a two-pass design. The main routine deals with the screen, checks for Basic and then calls *gazette* which handles the two passes.

In pass zero, DEF statements and any immediately following REM statements are listed: All other statements are ignored, then in pass one each subroutine is dissected as described below.

Routine *process–pass* does the line and statement scanning and spots machine code, Basic statements and specials like DIM and DATA.

Specials are listed immediately while general statements have the variable names in them extracted until the last character of the statement has been found.

The absolute location of the start of a statement is held in *strt*, and *scnt* is a count of the characters in it.

Routine *xtr–vrnms* stores the characters of a name in *v–buff* until an invalid variable name character or Basic token is found. For example, = and / are not valid characters within a name and therefore signal the end of the current name being extracted.

A complication is that the subroutine *xtr–vrnms* needs to be recursive to deal with statements like:

```
journey=hours*speed(carrot%
+whip%,animal%(donkey%))
```

Here the = and * terminate the variable names *journey* and *hours* and are easily extracted. However, the (following *speed* indicates an array name – which must be terminated by). The same applies to procedures and functions having arguments. The next character is not a) so *xtr–vrnms* is called recursively – remembering the unfinished *speed(* – to deal with the argument *carrot%*. This is terminated by a % and not followed by a (so it's just a variable name.

On return the + is found, not a), so another recursion picks out the variable *whip%* and on return, the remembered

Gazeter in brief

- The gazette display is in two parts: A list of the lines where procedures and functions are defined is output first, followed by the gazetted procedures and functions themselves.
- Every subroutine is treated as an individual item.
- In both the main part of a program and its subroutines, the first occurrence of a variable, procedure or function is found and listed with the Basic line number at which it occurs.
- Arrays, procedures and functions taking argument lists are displayed in such a way that the number of indices or arguments required is obvious.
- Special statements like DATA, DIM and * are highlighted.
- Early REM statements in a program or subroutine often explain the use or operation of the following statements, so they are gazetted. Later ones need not be, so the listing of REMs is toggled off by non-REM statements and on again by a DEF statement.
- Gazeter informs you when it encounters assembler source but doesn't gazette it.

array name is extended with a comma (*speed(,*). Again a) has still to be found so another recursion allows the extraction of the second argument. This argument also involves a recursion invoked by the (in front of *donkey%*.

After two returns the variables *carrot%*, *whip%*, *donkey* and the array variable *animal%()* have been saved in that order in *v–tbl* – the brackets tell us that *animal()* is a one-dimensional array.

The second) in the statement is now found, so terminating the extraction of the variable name *speed(,)* where the comma indicates a two-dimensional array.

The subroutine *xtr–vrnms* also skips Ascii strings and GOTO or GOSUB target line numbers, and numerical data is recognised by the fact that variables names may not start with a digit.

Before recursion an incomplete name like *speed(,* is marked by putting a zero byte in *v–buff*, thus starting another name. Once a complete name has been collected *hndl–vrnm* is called.

Before dealing with *hndl–vrnm*, I should mention one small problem that I didn't conquer. I call it the *compact implied THEN*.

To explain, take the transparent example:

```
IF A>&7F THEN G=2
```

which is clear to read and easy to analyse. But BBC Basic permits the opaque and possibly dangerous:

```
IFA>&7FG=2
```

Although it computes correctly, Gazeter cannot extract the *G* and, unless it is used elsewhere in the current procedure or function, it won't be gazetted.

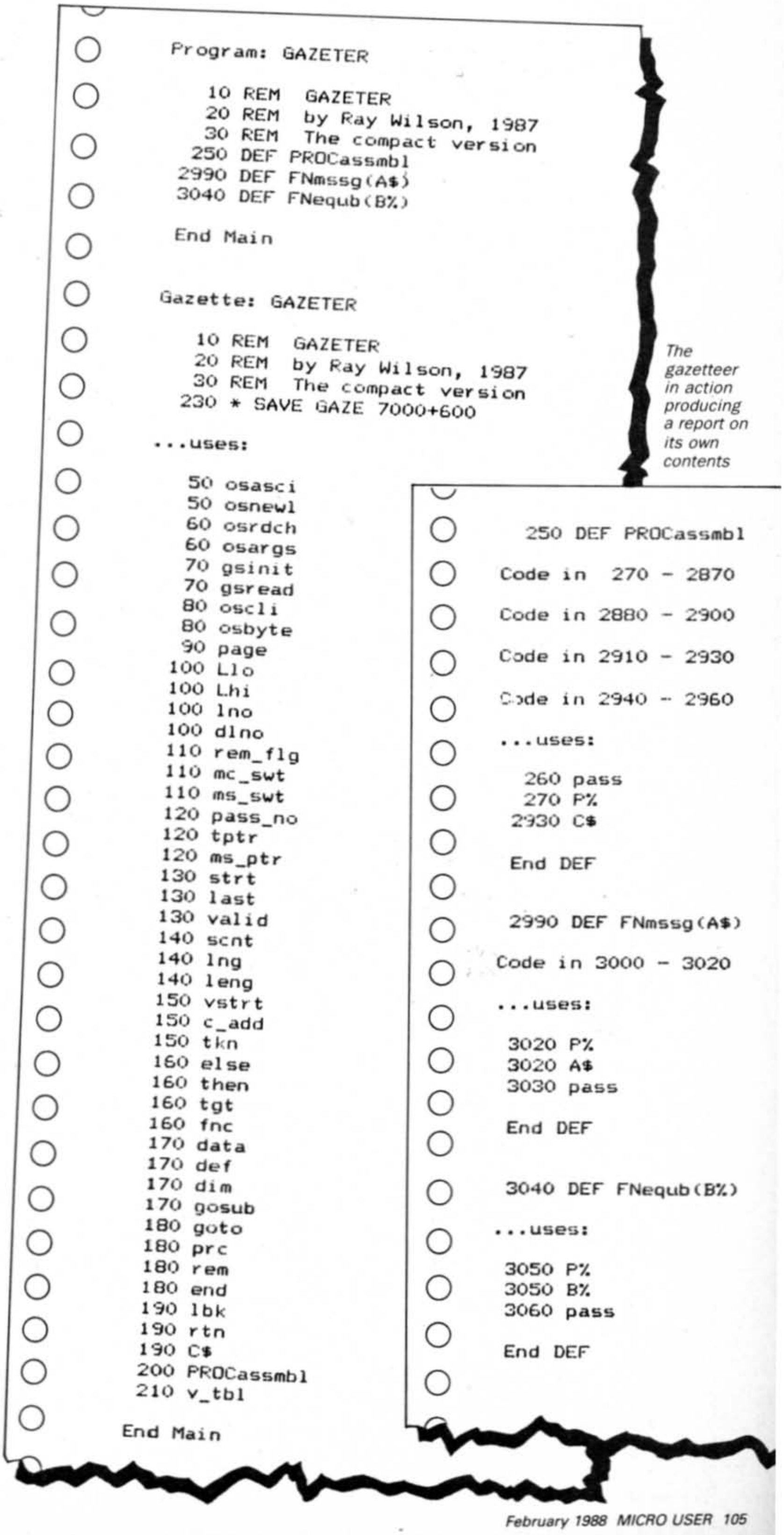
To continue with the explanation, *hndl–vrnm* throws away names beginning with a digit, decimal or hexadecimal numbers. It then counts the length of the name in *v–buf* back to the zero byte which signals its start.

Having done that it scans the table of names found so far to establish the uniqueness or otherwise, of the collected name.

A new variable name results in the length, line number and name being stored in *v–tbl*. The length is stored to help with searching the table for names which have already been found.

Eventually a DEF token, &DD, is found by *tst–spcl*. This causes *prt–vars* to print out the current contents of *v–tbl* before a new subroutine is processed.

When found, the end of program marker, &FF, invokes a final call to *prt–vars* so that the gazette of the final procedure or function is not forgotten – and your display is complete.



```
Program: GAZETER

   10 REM  GAZETER
   20 REM  by Ray Wilson, 1987
   30 REM  The compact version
  250 DEF PROCassmbl
 2990 DEF FNmssg(A$)
 3040 DEF FNequb(B%)

End Main


Gazette: GAZETER

   10 REM  GAZETER
   20 REM  by Ray Wilson, 1987
   30 REM  The compact version
  230 * SAVE GAZE 7000+600

...uses:

   50 osasci
   50 osnewl
   60 osrdch
   60 osargs
   70 gsinit
   70 gsread
   80 oscli
   80 osbyte
   90 page
  100 Llo
  100 Lhi
  100 lno
  100 dlno
  110 rem_flg
  110 mc_swt
  110 ms_swt
  120 pass_no
  120 tptr
  120 ms_ptr
  130 strt
  130 last
  130 valid
  140 scnt
  140 lng
  140 leng
  150 vstrt
  150 c_add
  150 tkn
  160 else
  160 then
  160 tgt
  160 fnc
  170 data
  170 def
  170 dim
  170 gosub
  180 goto
  180 prc
  180 rem
  180 end
  190 lbk
  190 rtn
  190 C$
  200 PROCassmbl
  210 v_tbl

End Main
```

```
  250 DEF PROCassmbl

Code in  270 - 2870

Code in 2880 - 2900

Code in 2910 - 2930

Code in 2940 - 2960

...uses:

  260 pass
  270 P%
 2930 C$

End DEF


 2990 DEF FNmssg(A$)

Code in 3000 - 3020

...uses:

 3020 P%
 3020 A$
 3030 pass

End DEF


 3040 DEF FNequb(B%)

...uses:

 3050 P%
 3050 B%
 3060 pass

End DEF
```

The gazetteer in action producing a report on its own contents

◀ *From Page 105*

```
10 REM GAZETER
20 REM by Ray Wilson, 1987
30 REM (c) The Micro User
40 MODE7:HIMEM=&7000:VDU14
50 osasci=&FFE3:osnewl=&FFE7
60 osrdch=&FFE0:osargs=&FFDA
70 gsinit=&FFC2:gsread=&FFC5
80 oscli=&FFF7:osbyte=&FFF4
90 page=&18
100 Llo=&70:Lhi=&71:lno=&72:dlno=&74
110 rem_flg=&79:mc_swt=&7A:ms_swt=&7B
120 pass_no=&7C:tptr=&7D:ms_ptr=&7F
130 strt=&81:last=&83:valid=&84
140 scnt=&85:lng=&86:leng=&87
150 vstrt=&88:c_add=&8A:tkn=&80
160 else=&8B:then=&8C:tgt=&8D:fnc=&A4
170 data=&DC:def=&DD:dim=&DE:gosub=&E4
180 goto=&E5:prc=&F2:rem=&F4:end=&FF
190 lbk=ASC"(":rtn=&0D:C$=CHR$rtn
200 PROCassmbl
210 IFv_tbl<>&75ECPRINT"BAD CODE":END
220 PRINT"Saving as GAZE"
230 *SAVE GAZE 7000+600
240 END
250 DEFPROCassmbl
260 FORpass=0TO2STEP2
270 P%=&7000:[OPTpass
280 .Gazetter JSR init
290 LDA (strt),Y:CMP #rtn
300 BEQ cntnu:BRK:BRK:BRK
310 .cntnu JSR gazette:JMP cls_spool
320 .init
330 OPT FNmssg(CHR$3+CHR$22+CHR$7)
340 OPT FNmssg(CHR$14+C$+"GAZETTER ")
350 OPT FNmssg("by Ray Wilson")
360 OPT FNmssg(" 1987"+CHR$3+C$)
370 OPT FNmssg(C$+"Printer?:(Y/N)")
380 JSR osrdch:CMP#ASC"Y":BNE cmd_chk
390 OPT FNmssg(CHR$2+CHR$15+C$)
400 .cmd_chk JSR chk_spool
410 .init_ptrs LDA page:STA strt+1
420 LDY #0:STY strt:RTS
430 .gazette LDA #0:STA pass_no
440 OPT FNmssg(C$+"Program: ")
450 JSR process_pass
460 OPT FNmssg(C$+"Gazette: ")
470 INC pass_no
480 .process_pass JSR prg_nme
490 LDA #rem:STA rem_flg:LDA #ASC"["
500 STA mc_swt:LDA #0:STA ms_swt
510 STA v_tbl:STA v_buff
520 .next_ln INY:LDA (strt),Y:STA Lhi
530 INY:LDA (strt),Y:STA Llo:INY:INY
540 .next_stmt JSR nxt_stmt
550 LDA pass_no:BEQ basic_stmt
560 JSR tst_mc:BEQ tst_ln_nd
570 .basic_stmt JSR tst_spcl
580 BEQ tst_ln_nd:LDY #0:LDX #0
590 .xtrction JSR xtr_vrnms
600 CPY scnt:BMI xtrction
610 .tst_ln_nd LDY scnt:LDA (strt),Y
620 INY:CMP #rtn:BNE next_stmt
630 .tst_prog_nd LDA (strt),Y:DEY
640 CMP #end:BNE next_ln:JMP prt_vars
650 .cls_spool LDA#rtn
660 STA oscli_cmd+5:BNE fn_done
670 .chk_spool LDX #c_add:LDY#0
680 LDA#1:JSR osargs:LDA c_add:STA&F2
690 LDA c_add+1:STA&F3:LDY#0:CLC
700 JSR gsinit:BNE fn_loop:RTS
710 .fn_loop JSR gsread:BCS fn_done
720 STA f_name-1,Y:CPY#7:BNE fn_loop
730 .fn_done LDX #oscli_cmd MOD256
740 LDY #oscli_cmd DIV256:JMP oscli
750 .prg_nme JSR init_ptrs:LDY #4
760 JSR skpspc:CMP #rem:BNE prg_rtn
770 INY:JSR skpspc
780 .prg_loop LDA (strt),Y:JSR osasci
790 INY:CMP #rtn:BNE prg_loop
800 .prg_rtn LDY#0:JMP osnewl
810 .nxt_stmt JSR skpspc:TYA:LDY #0
820 CLC:ADC strt:STA strt
830 BCC find_nd:INC strt+1
840 .find_nd LDA (strt),Y
850 CMP #ASC"""":BNE find_nd_1
860 JSR skp_asc:BNE find_nd
```

This is one of hundreds of programs available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs in the MicroLink library will also run on the Electron.

```
870 .find_nd_1 CMP #ASC":":BEQ st_nd
880 CMP #else:BEQ st_nd:CMP #then
890 BEQ st_nd:CMP #rtn:BEQ st_nd
900 INY:BNE find_nd
910 .st_nd STY scnt:LDY #0:RTS
920 .tst_mc LDA (strt),Y:CMP mc_swt
930 BNE mc_nd:INY:LDA mc_swt
940 EOR #&6:STA mc_swt:CMP #ASC"]"
950 BNE nd_mc:OPT FNmssg(C$+"Code in")
960 JSR prtL:BNE mc_nd
970 .nd_mc OPT FNmssg("-")
980 JSR prtL:JSR osnewl
990 .mc_nd LDA mc_swt:CMP #ASC"]":RTS
1000 .tst_spcl LDA (strt),Y:LDX #0
1010 CMP #rem:BNE tst_rst:CMP rem_flg
1020 BEQ prt_spcl:LDA #0:RTS
1030 .tst_rst STA rem_flg:INX
1040 LDA pass_no:BNE tst_data
1050 INX:INX:BNE tst_def
1060 .tst_data LDA (strt),Y
1070 CMP #data:BEQ prt_spcl:INX
1080 CMP #ASC"*":BEQ prt_spcl:INX
1090 CMP #dim:BEQ prt_spcl
1100 .tst_def LDA (strt),Y:INX:CMP #def
1110 BEQ tst_pr_fn:LDA pass_no:RTS
1120 .tst_pr_fn INY:JSR skpspc
1130 CMP #fnc:BEQ itsa_def:INX
1140 .itsa_def LDA pass_no:BEQ prt_spcl
1150 JSR prt_vars:LDA #rem:STA rem_flg
1160 JSR osnewl
1170 .prt_spcl JSR prtL:TXA:BNE not_rem
1180 OPT FNmssg("REM ")
1190 .not_rem DEX:BNE not_data
1200 OPT FNmssg("DATA ")
1210 .not_data DEX:BNE not_str
1220 OPT FNmssg("* ")
1230 .not_str DEX:BNE not_dim
1240 OPT FNmssg("DIM ")
1250 .not_dim DEX:BNE not_fnc
1260 OPT FNmssg("DEF FN")
1270 .not_fnc DEX:BNE prt_rest
1280 OPT FNmssg("DEF PROC")
1290 .prt_rest INX:INX
1300 .prt_loop INY:LDA (strt),Y
1310 CMP #rtn:BEQ prt_nd:CPX #0
1320 BMI prt_chrs:CMP #ASC":"
1330 BEQ prt_nd:CMP #ASC"=":BEQ prt_nd
1340 CMP #tkn-1:BCS prt_nd
1350 .prt_chrs JSR osasci:BNE prt_loop
1360 .prt_nd STY scnt:JSR osnewl
1370 LDA #0:RTS
1380 .xtr_vrnms LDA (strt),Y:CMP #tgt
1390 BNE xtr_1:INY:INY:INY
1400 .xtr_rtn INY:RTS
1410 .xtr_1 CMP #ASC"""":BNE xtr_2
1420 JMP skp_asc
1430 .xtr_2 JSR chk_val_1:BEQ xtr_rtn
1440 STA valid:TXA:PHA:LDA valid
1450 JSR pushc:CMP #lbk:BEQ tst_rbk
1460 LDA #&FF:STA last
1470 .til_inval STA valid:LDA (strt),Y
1480 JSR chk_val_2:BEQ set_val
1490 LDA valid:AND last
1500 .set_val STA valid:LDA (strt),Y
1510 CMP #lbk:BNE tst_p_d
1520 JSR pushc:BNE tst_rbk
1530 .tst_p_d CMP #ASC"%":BEQ rst_last
1540 CMP #ASC"$":BNE tst_val
1550 .rst_last LDA #0:STA last
1560 .tst_val LDA valid:BEQ tst_cnt
1570 .push_seq JSR push_char
1580 CPY scnt:BNE til_inval:BEQ tst_cnt
1590 .tst_rbk LDA (strt),Y:CMP #ASC")"
1600 BNE tst_cma:JSR pushc:JMP tst_cnt
1610 .tst_cma CMP #ASC",":BNE recurse
1620 JSR pushc
1630 .recurse LDA #0:JSR pushc
1640 DEY:JSR xtr_vrnms:DEX:JMP tst_rbk
1650 .tst_cnt TXA:BNE hndl_vrnm
1660 PLA:TAX:RTS
1670 .push_char LDA (strt),Y
1680 .pushc STA v_buff,X:INX:INY:RTS
1690 .hndl_vrnm TYA:PHA:LDY #&FF
1700 .find_lng DEX:INY:LDA v_buff,X
1710 BNE find_lng:INX:LDA v_buff,X:DEX
1720 CMP #lbk:BEQ hndl_rtn
1730 CMP #ASC"&":BEQ hndl_rtn
1740 CMP #ASC"0":BCC lng_fnd
1750 CMP #ASC":":BCC hndl_rtn
1760 .lng_fnd STY lng:STY leng
1770 LDA #v_tbl MOD256:STA tptr
1780 LDA #v_tbl DIV256:STA tptr+1
1790 STX vstrt:BNE ptr_mvd
1800 .pt_nxt LDA lng:STA leng
1810 .pt_nxt_1 CLC:ADC #3:ADC tptr
1820 STA tptr:BCC ptr_mvd:INC tptr+1
1830 .ptr_mvd LDY #0:LDX vstrt
1840 LDA (tptr),Y:BEQ mt_slot
1850 CMP lng:BNE pt_nxt_1:INY:INY
1860 .try_mtch INX:INY:LDA (tptr),Y
1870 CMP v_buff,X:BNE pt_nxt:DEC leng
1880 BNE try_mtch:BEQ hndl_rtn
1890 .mt_slot LDA lng:STA (tptr),Y
1900 INY:LDA Llo:STA (tptr),Y
1910 INY:LDA Lhi:STA (tptr),Y
1920 .nxt_char INX:INY:LDA v_buff,X
1930 STA (tptr),Y:DEC lng:BPL nxt_char
1940 LDA #0:STA (tptr),Y
1950 .hndl_rtn JMP pv_rtn
1960 .prt_vars TXA:PHA:TYA:PHA
1970 LDA v_tbl:BEQ pv_nd
1980 OPT FNmssg(C$+"...uses:"+C$+C$)
1990 LDA #v_tbl DIV256:STA tptr+1
2000 LDA #v_tbl MOD256:STA tptr:LDY #0
2010 .prt_v_loop LDA (tptr),Y
2020 BEQ pv_nd:TAX:INY:LDA (tptr),Y
2030 STA lno:INY:LDA (tptr),Y
2040 STA lno+1:JSR prt_L
2050 .prt_v_2 INY:LDA (tptr),Y
2060 CMP #fnc:BNE not_fn
2070 OPT FNmssg("FN"):BNE prt_v_nd
2080 .not_fn CMP #prc:BNE prt_v_3
2090 OPT FNmssg("PROC"):BNE prt_v_nd
```

```
2100 .prt_v_3 JSR osasci
2110 .prt_v_nd DEX:BNE prt_v_2
2120 JSR osnewl:INY:TYA:LDY #0:CLC
2130 ADC tptr:STA tptr:BCC prt_v_loop
2140 INC tptr+1:BNE prt_v_loop
2150 .pv_nd LDA #0:STA v_tbl
2160 OPT FNmssg(C$+" End ")
2170 LDA ms_swt:BNE pv_sub
2180 OPT FNmssg("Main"+C$+C$)
2190 INC ms_swt:BNE pv_rtn
2200 .pv_sub OPT FNmssg("DEF"+C$+C$)
2210 .pv_rtn PLA:TAY:PLA:TAX:RTS
2220 .skpspc LDA (strt),Y:INY
2230 CMP #ASC" ":BEQ skpspc:DEY:RTS
2240 .skp_asc INY:LDA (strt),Y
2250 CMP #ASC"""":BNE skp_asc:INY:RTS
2260 .mssg PLA:STAms_ptr:PLA
2270 STAms_ptr+1:TYA:PHA:LDY #0
2280 .ms_loop INY:LDA(ms_ptr),Y
2290 JSR osasci:BNE ms_loop
2300 SEC:TYA:ADC ms_ptr:STA ms_ptr
2310 BCC ms_rtn:INC ms_ptr+1
2320 .ms_rtn PLA:TAY:JMP(ms_ptr)
2330 .chk_val_2
2340 CMP #lbk:BEQ val
2350 CMP #tkn-1:BPL inv
2360 CMP #ASC"$":BCC inv
2370 CMP #ASC"&":BCC val
2380 .chk_val_1
2390 CMP #ASC"&":BEQ val
2400 CMP #fnc:BEQ val
2410 CMP #prc:BEQ val
2420 CMP #tkn-1:BPL tst_tkn
2430 CMP #ASC"0":BCC inv
2440 CMP #ASC":":BCC val
2450 CMP #ASC"@":BCC inv
2460 CMP #ASC"[":BCC val
2470 CMP  #ASC"_":BCC inv
2480 CMP #ASC"{":BCS inv
2490 .val AND #&FF:RTS
2500 .tst_tkn CMP #&8A:BEQ spc_tkn
2510 CMP #&A7:BEQ spc_tkn
2520 CMP #&B0:BEQ spc_tkn
2530 CMP #&C0:BCC inv
2540 CMP #&C3:BCC spc_tkn
2550 CMP #&C4:BEQ spc_tkn
2560 .inv LDA #0:RTS
2570 .spc_tkn LDA #lbk:RTS
2580 .prtL LDA Llo:STA lno
2590 LDA Lhi:STA lno+1
2600 .prt_L TXA:PHA:TYA:PHA:LDX #4
2610 .clrd LDA #0:STA dlno,X:SEC
2620 .cntd LDA lno:SBC L_tbl,X:TAY
2630 LDA lno+1:SBC M_tbl,X:BCC nxp
2640 STA lno+1:STY lno
2650 INC dlno,X:JMP cntd
2660 .nxp DEX:BPL clrd:LDX #4
2670 .pls LDA dlno,X:BNE pd
2680 JSR pspc:DEX:BNE pls
2690 .pd LDA dlno,X:AND #&0F
2700 CMP #&0A:BCC pg:ADC #&06
2710 .pg ADC #&30:JSR osasci
2720 DEX:BPL pd:PLA:TAY:PLA:TAX
2730 .pspc LDA #&20:JMPosasci
2740 .L_tbl
2750 OPT FNequb(1)
2760 OPT FNequb(10)
2770 OPT FNequb(100)
2780 OPT FNequb(232)
2790 OPT FNequb(16)
2800 .M_tbl
2810 OPT FNequb(0)
2820 OPT FNequb(0)
2830 OPT FNequb(0)
2840 OPT FNequb(3)
2850 OPT FNequb(39)
2860 .v_buff
2870 ]:P%=P%+256
2880 [OPT pass
2890 .oscli_cmd
2900 ]:$P%="SPOOL ":P%=P%+6
2910 [OPT pass
2920 .f_name
2930 ]:$P%=" "+C$:P%=P%+8
2940 [OPT pass
2950 .v_tbl
2960 ]
2970 NEXT
2980 ENDPROC
2990 DEF FNmssg(A$)
3000 [OPT pass
3010 JSR mssg
3020 ]:$P%=A$+CHR$0:P%=P%+LENA$+1
3030 =pass
3040 DEF FNequb(B%)
3050 ?P%=B%:P%=P%+1
3060 =pass
```

This listing is included in this month's tape & disc offer. See order form on Page 165.

Get it right!

```
  10 =    0 0 |  350 = EBD3 0 |  690 = 8A38 B | 1030 = 73DE 1 | 1370 = A2A0 F | 1710 = 9A38 B | 2050 = 656C 9 | 2390 = 67A8 0 | 2730 = BFE4 9
  20 =    0 0 |  360 = E272 C |  700 = 801A F | 1040 = F6C2 8 | 1380 = 639F D | 1720 = EBD1 C | 2060 = C70E 2 | 2400 = 7BAB 5 | 2740 = 4A97 2
  30 =    0 0 |  370 = 9AA1 1 |  710 = D33A 1 | 1050 = 8346 1 | 1390 = 1CE0 A | 1730 = F90C C | 2070 = 81C5 A | 2410 = AC8A 5 | 2750 = 56E8 1
  40 = 79D6 6 |  380 = 42DA E |  720 = FA33 3 | 1060 = 8075 0 | 1400 = 3290 E | 1740 = 56A4 C | 2080 = E208 7 | 2420 = D6C6 5 | 2760 = DE93 B
  50 = 86C1 5 |  390 = 264A 7 |  730 = FAA5 9 | 1070 = F509 8 | 1410 = C385 9 | 1750 = B099 8 | 2090 = EF83 B | 2430 = 81AE 9 | 2770 = B513 B
  60 = 1477 D |  400 = A355 7 |  740 =  836 2 | 1080 = A89C D | 1420 = 1A18 D | 1760 = 6F29 0 | 2100 = 4885 1 | 2440 = D978 E | 2780 = 11FD 4
  70 = 9A36 E |  410 = 4595 E |  750 = D914 E | 1090 = 272F B | 1430 = 9A2E 7 | 1770 = 3619 9 | 2110 = 6D80 C | 2450 = 5E2F B | 2790 = 7435 2
  80 = 37B9 1 |  420 = 4A1A A |  760 = 457E B | 1100 = C70B 3 | 1440 = A779 8 | 1780 = 9D9C 3 | 2120 = 2D37 5 | 2460 = FD2A 8 | 2800 = E0C6 7
  90 = B653 B |  430 = 1FEC 7 |  770 = 6E81 7 | 1110 = 2ACA A | 1450 = C807 7 | 1790 =  667 D | 2130 = C425 2 | 2470 = 9C08 0 | 2810 = 65D9 6
 100 = EDFE 4 |  440 = 3017 C |  780 = 9F0B A | 1120 = 8996 5 | 1460 = 57F7 E | 1800 = 7F12 1 | 2140 = 9785 C | 2480 =  C6A C | 2820 = 65D9 F
 110 = B562 4 |  450 = A454 5 |  790 = E6BA 8 | 1130 = 4CFD C | 1470 = 8F89 4 | 1810 = BFC6 B | 2150 = F843 B | 2490 = F2FC 8 | 2830 = 65D9 A
 120 = 57B6 B |  460 = 38D7 1 |  800 = BACD 9 | 1140 = 970F 4 | 1480 = C578 7 | 1820 = C5D0 3 | 2160 = BA93 0 | 2500 = 327F D | 2840 = 308A 0
 130 = 4D64 3 |  470 =  FBE 7 |  810 = E1F5 8 | 1150 = 9730 D | 1490 = D3AA 6 | 1830 = 28D3 8 | 2170 = E43A 0 | 2510 = C8BA F | 2850 =  A6B B
 140 = 8B5C 0 |  480 = 88E3 2 |  820 = F11D F | 1160 = 3334 D | 1500 = CF36 3 | 1840 =  229 D | 2180 = 7232 7 | 2520 = 8F11 6 | 2860 = CE66 1
 150 = 43A5 5 |  490 = 4CB7 3 |  830 = B714 C | 1170 = 2B3D 3 | 1510 = EEB4 6 | 1850 = 8924 E | 2190 = E93A B | 2530 = AE04 5 | 2870 = FA52 6
 160 = 18A6 A |  500 = 7C89 D |  840 = 7626 C | 1180 = 391D 0 | 1520 = 6E98 0 | 1860 = 710F 4 | 2200 = 5E7E F | 2540 = DDF3 A | 2880 = 4E48 3
 170 = ABEF 4 |  510 = B671 0 |  850 = 3E93 5 | 1190 = 2DA1 E | 1530 = 630E A | 1870 = 54AD 9 | 2210 = 7506 E | 2550 = F1DD 2 | 2890 = A488 4
 180 = A198 0 |  520 = 3766 4 |  860 = 7755 4 | 1200 = AE14 F | 1540 = 7789 9 | 1880 = 1331 7 | 2220 = B59D 8 | 2560 = 3E9D C | 2900 = DD8E A
 190 =  73B C |  530 = 42C1 7 |  870 = B893 A | 1210 = 52E2 D | 1550 = 9F26 F | 1890 = 441E 2 | 2230 = E03E 5 | 2570 = E67A 9 | 2910 = 4E48 9
 200 = 6666 7 |  540 = FB7A 5 |  880 =  CD3 2 | 1220 = 2268 2 | 1560 = 93F3 3 | 1900 = 8785 F | 2240 = 8117 3 | 2580 = DB5D F | 2920 = E8EA 2
 210 = 454B 9 |  550 = 42CE C |  890 = 7586 6 | 1230 = D5F2 5 | 1570 = 3D9C A | 1910 = 1750 B | 2250 = 673E E | 2590 = 6FA5 8 | 2930 = 9D33 7
 220 = 5CBB D |  560 = 2FD5 D |  900 = E473 0 | 1240 = 2553 A | 1580 = 4E18 7 | 1920 = E351 1 | 2260 = 597A 8 | 2600 = F793 5 | 2940 = 4E48 A
 230 =  C69 E |  570 = FE83 9 |  910 = B6ED 4 | 1250 = 2130 1 | 1590 = 929E 5 | 1930 = BF71 A | 2270 = E8C7 F | 2610 = 8318 A | 2950 =   D7 2
 240 = FD2E 0 |  580 = A1A2 5 |  920 = 5264 4 | 1260 = 5A5B 7 | 1600 = 7111 7 | 1940 = 7841 D | 2280 = F620 3 | 2620 = 7752 F | 2960 = 8B58 9
 250 =  6E7 5 |  590 = 8650 6 |  930 = CC05 2 | 1270 = C6A2 9 | 1610 = 6C62 C | 1950 = 1DA6 D | 2290 = B6D1 5 | 2630 = 4C79 5 | 2970 = 2C83 C
 260 = C134 6 |  600 = 5C13 2 |  940 = 10A2 A | 1280 = FBCF 0 | 1620 = B084 8 | 1960 = AE4A 3 | 2300 = A72D B | 2640 = 4102 F | 2980 = ED0F A
 270 = E506 0 |  610 = 2182 1 |  950 = D852 5 | 1290 = 7A17 9 | 1630 = 1DE0 2 | 1970 = DE6D 4 | 2310 = 7F60 5 | 2650 = 39B3 2 | 2990 = 9B5C A
 280 = E07D 1 |  620 = F8F2 D |  960 = AFCC B | 1300 = B752 B | 1640 = 5E4D B | 1980 = 7BE3 2 | 2320 = 9D0C 0 | 2660 = BDF8 9 | 3000 = 4E48 3
 290 = DDBC 4 |  630 = 53EE 3 |  970 = AE47 B | 1310 = 9140 2 | 1650 = 86C5 0 | 1990 = 9D9C 0 | 2330 = 12A7 B | 2670 = 3ACE 6 | 3010 =  69E 5
 300 = 5658 D |  640 = 3AAE 2 |  980 = EB93 1 | 1320 = AD50 F | 1660 = 2829 B | 2000 = 9CFC F | 2340 = B717 9 | 2680 = 8FE0 E | 3020 = 5986 F
 310 = 6121 2 |  650 = 29F6 1 |  990 = BCC5 6 | 1330 = 921D 9 | 1670 = 3AE2 2 | 2010 = 9F3B E | 2350 = 2BC5 6 | 2690 = D8ED 9 | 3030 = D044 E
 320 = 6272 2 |  660 =  720 4 | 1000 = AC91 D | 1340 = 43DD 0 | 1680 = E60A 3 | 2020 = A334 7 | 2360 = B80D 6 | 2700 = 45B2 A | 3040 = 21B2 1
 330 = CA2E B |  670 = 5988 8 | 1010 = 7B3F 0 | 1350 = 75BC 3 | 1690 = 600C 4 | 2030 = 1577 A | 2370 = AA90 1 | 2710 = D792 7 | 3050 = C69E E
 340 = 4D41 7 |  680 = ACDF 1 | 1020 = F850 A | 1360 = 19DE 9 | 1700 = E333 6 | 2040 = FC15 7 | 2380 = 22C4 2 | 2720 = FC13 5 | 3060 = D044 D
```

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Archimedes micro

A Computer for BUSINESS, RESEARCH, EDUCATION & HOME USE

The Acorn Archimedes range of microcomputer comprises of four machines – the 305 and 310 with 0.5 and 1 MB of RAM, and the 410 and 440, with 1 and 4 MB. All have 0.5 MB of ROM and one 3.5" floppy disc drive of 800K as standard. The 440 also has a Winchester drive of 20MB – all mounted internally.

They have separate keyboard and a three button mouse as standard. The Keyboard is compatible with the new IBM ATE layout, with 12 function keys.

The standard display is a high resolution mono colour monitor. A colour, multifrequency monitor is optional.

The screen modes include:

- 80 × 25 or 32 characters, in 2, 4 or 16 colours for wordprocessing, etc.
- 132 × 25 or 32 characters, for spreadsheets, etc.
- Up to 640 × 256 dots × 256 colours (with single frequency monitor) and up to 640 × 512 dots × 16 colours (with a multi frequency monitor), for graphics, etc.

The sound system can have upto eight channels playing at once, from up to 32 instruments or voices, using waveform synthesis and stereo output.

The outlets for the monitor, printer, serial port and audio are all at the rear, and have industry standard connectors.

The 410 and 440 have a backplane for four expansion podules and the circuitry for a Winchester disc drive as standard.

The complete operating system – including Window Manager and Desktop – is in 0.5 MB of ROM. It can access directly all the RAM that can be fitted (upto 4 MB).

The Advanced Disc Filing System uses robust, pocket-sized 3.5" discs with a new 800K format, but also reads, writes and formats the 640K discs used by the Master series. As well as 25% more capacity, the new format allows almost four times the data transfer rate.

A battery-backed clock-calender, and CMOS RAM to hold configuration setting is standard.

Expansion is via internal plug-in boards (podules), which connect with the backplane.

ARCHIMEDES PRICES

305 Series

● Entry System	£699
● with Green Monitor	£749
● with Colour Monitor	£899

310 Series

● Entry System	£775
● with Green Monitor	£825
● with Colour Monitor	£975

310M Series

● Entry System	£835
● with Green Monitor	£885
● with Colour Monitor	£1035

410 Series

● Entry System	£1399
● with Green Monitor	£1449
● with Colour Monitor	£1599

440 Series

● Entry System	£2299
● with Green Monitor	£2349
● with Colour Monitor	£2499

● 0.5 Mb RAM for 305	£85
● Podule Backplane	£37
● ROM Podule	£37
● Archimedes Ref Manual	£20
● ARM Assem. Lang Prog Manual	£12

(Securicor carr. £7 on Micros)

Podules expected this year (from Acorn unless stated) include:

● 2nd 800K floppy disc drive (for 305, 310 & 410)	£125
● Econet Network Board	£43
● Backplane for 2 podules, with fan (305, 310)	£49
● I/O Podule (with User port, Analogue port & 1MHz bus)	£79
● MIDI add-on to I/O Podule	£29
● ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K)	TBA
● Modem Podule (Beebug)	TBA
● Real time Video Digitiser (Watford)	TBA
● Sound Sampler (Armadillo)	£78
● Speech Podule (Tubelink)	TBA

Due in the 2nd quarter 1988

PC Podule, with 10 MHz 80186, 640K and floppy disc interface, (for all models). This should run about 3.5 times as fast as an IBM-PC. Fully IBM compatible.

SPECIAL OFFER

With every Archimedes Micro purchased from us, we are giving away absolutely **FREE** a 5¼", double sided disc drive with PSU, (1 Megabyte unformatted), plus the special Archimedes interface cable, worth **£125**.

(P.S. This offer does not apply with 0% finance scheme mentioned below).

0% (APR) FINANCE

*For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at **0% (APR)** finance. Credit facility available for up to 12 months, subject to status. Please inquire for further details. (Watford Electronics are Licenced Credit Brokers)*

NEW

CREDIT TERMS now available. Please telephone or write in for further information.

What Archimedes does and can do

The software on the welcome disc includes four applications.

"PAINT" is a simple mouse driven art package, operating in the 640 × 250 × 16 colour screen mode. Images can be produced without any programming and saved to disc for use elsewhere.

The sprite editor allows sprites to be created pixel by pixel in the 640 × 256 × 16 and 256 colour screen modes. It can also be used to edit pictures from "Paint". The results can be used in Basic programs for animated graphics.

The Font Designer allows you to design individual letters and symbols – and save them together as a font". They may be "anti-aliased", for even better appearance on screen.

The Music Editor allows you to enter music in standard notations, with upto four "parts", and save it to disc. It may be played via the internal speaker (in mono) or via external headphones or hi-fi (in stereo). The voices or instruments (or which there are nine as standard), and their volume, tempo and stereo position may all be varied while playing.

BBC Basic 5

This is upwards compatible with earlier versions, so most programs written in them will run – though far faster. Even using a 305, upto 370K is available in Basic. It also affords access to all the new graphics, windowing and sound facilities – as shown by the applications on the Welcome Disc. As well as being in the system ROM, BBC Basic 5 is provided on disc for loading into RAM because it then runs about 40% faster. This speed makes it the FASTEST MICRO IN THE WORLD". BBC Basic 5 includes an in-line Assembler.

WORDPROCESSORS

Wordwise +	£20
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View	£50

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Viewsheet	£50

BUSINESS GRAPHICS

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Medow Computers' suite of 4 Modules Minerva's suite of 5 Modules	P.O.A.

ART & DESIGN

Artisan	£34

GAMES

Zarch	£17

EDUCATION

A great many packages are expected in early 1988. The topics include: Business Studies, Maths, General Science, Biology, Physics, Chemistry, Economics, Geography, History & Music.

PC EMULATION

The Acorn PC Emulator (for 310, 410 & 440), includes MS-DOS 3.21 and is available NOW at £99. It runs most MSDOS and many PC-DOS applications (which number over 10,000). Compared with IBM PC, this all-software emulator can calculate about half as fast, and write to the screen about a quarter as fast. This makes it more suitable for running spreadsheets (such as Lotus 1-2-3) than wordprocessors (such as Wordstar). However it includes utilities for copying disc files between DOS and ADFS formats, so that data may be transferred to and from Archimedes applications. The 3.5" discs used by the new IBM PS/2 models, and by many DOS portables, may be read, written and formatted directly. 5.25" discs require an additional, external drive, which is available as an option. The PC Podule (due second quarter '88), will run very much faster.

£99

LANGUAGES

Acornsoft ANSI "C", ISO-Pascal, Fortran 77, Cambridge LISP and PROLOG X are all available now at **£95** each, as is the Twin Editor, at **£29**. These require at least a 310. The ANSI "C" affords access to all the graphics, windowing and sound facilities of the Archimedes and executes at exceptional speed – 14 to 26 times that of a PC, 5 to 10 times that of an AT, and as fast as most 386 machines. (For demonstration, call in at our retail shop.

If you require technical literature, then simply telephone us).

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with two disks, one 5.25" for the BBC, the other 3.5" format for the Archimedes, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. Upto FOUR drives can be connected and NO SOLDERING is involved. Supplied complete with necessary lead.

Only £25

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Archimedes.

BBC MASTER

BBC MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and **Watford's** 3½", double sided 1 Megabyte (unformatted) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

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512K Processor Add on Board "inc. Mouse and GEM package" **£185**

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Reference Manual II	(No VAT) **£14**
Advance Ref. Manual	(No VAT) **£19**
64K Upgrade Kit for B+	**£32**
Acorn 1770 DFS Kit complete	**£41**
ECONET Upgrade Kit for BBC	**£42**
ALL ECONET UPGRADES Available	
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ARIES' Professional IEEE Interface	**£238**
Acorn IEEE Interface Complete	**£265**
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BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled software.

System 1	Standard Package	**£310**
System 1A	System 1 + TV Modulator	**£322**
System 2	System 1 + Green Hires Monitor	**£364**
System 3	System 1 + Medium Res Colour Monitor	**£478**
RS232 Kit for BBC Compact		**£25**
Additional 3½" Drive for BBC Compact		**£90**

(Securicor carriage £7)

CO-PRO Adaptor

CO-PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35 (carr £5)

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(0923) 50234 or 33383

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

£259

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B.

£135

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £3.00
27128-250nS £3.50

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.50
2 × 6264LP (16K) £4.80

NEW Z88 Sinclair's Portable Micro

Watford Electronics announce a very special new – and affordable portable microcomputer, tailor-made for the BBC Micro user on the move – the Cambridge Z88.

The Cambridge Z88 is a versatile portable micro, bursting at the seams with built-in software ready and waiting for you to use at the push of a button. There is BBC BASIC, a word processor, a database, a terminal, a filer a diary and a calculator, all integrated and all inclusive!

The Cambridge Z88 uses just four AA batteries, and from this it will store all of your programs and files on a built-in RAM disc, so there are no cassettes to worry about or discs to lose.

The LCD display is particularly impressive, using state of the art Supertwist technology, the display is sharp at all times, and clear under even the worst lighting conditions.

The word processor is based on Acorn's View package; View is the most popular word processor available for the BBC Micro, and files and programs written on the Z88 can be transferred to and from the BBC Micro with consummate ease.

The Pipedream word processor is possible the single most powerful package written for a portable yet! Being an integrated Spreadsheet and word processor you can combine text and numbers to create stunning reports, timetables or simply letters in a variety of column widths (up to 80 column) and numeric data can be freely sorted searched and calculated INSIDE a text file – a feature only previously available on much more expensive software packages running on large machines.

Nearly all of the 32K memory is available as the RAM Disk, although additional memory packs of 128K are also available, just plug them into the machine (no soldering – no screwing) and you have four times the memory you had before, all of which is available to the Word Processor.

Connecting the Z88 to the BBC Micro is easy; by plugging in the RS232 cable from the Z88 into the RS423 socket in the back of the BBC Micro, a data exchange as fast as 19200 baud is achieved, making the Z88 a fast machine for data transfer.

Custom software is available for the BBC Micro enabling automatic transfer of files to and from the Z88 with automatic conversion and full error checking. The connecting lead plugs straight into the back of the BBC Micro and into the side of the Z88 to form a reliable data link faster than some disc drives!

The Z88 is rugged, reliable, lightweight and compact. It is considerably lighter than all other portable computers currently available, and because it doesn't need disc drives, it is more reliable than any PC "laptop" portables making it especially useful to the BBC Micro owner away from work or home.
home.

Here's what A&B Computing had to say about the Z88:

"The Z88 is an especially worthy machine to have on the move because the files it creates in Pipedream are directly compatible with View Professional... you can write a full report using all of the facilities of Pipedream, port it across using the BBC link software and load it into View Professional".

"The Z88 is surprisingly easy to connect to the outside world – it simply has oodles of RAM disc (up to three megabytes) which can be plugged into the machine".

Need we say more? The Cambridge Z88 – a very special computer. Our Managing Director likes it so much that, he uses it!

Price: **£250** **(carr £4)**

FREE

As an introductory offer, we are giving 4 Rechargeable Batteries absolutely FREE with every Z88 Micro, purchased from us this month.

ACCESSORIES

Mains Adaptor	**£8.65**
32K RAM Pack or EPROM Pack	**£17.35**
128K RAM Pack or EPROM Pack	**£43.40**
Z88 BBC Link	**£21.70**
Z88 PC Link	**£21.70**
Z88 EPROM ERASER	**£34.75**
Serial Printer Cable	**£8.65**
Parallel Printer Cable	**£24.00**
Z88 Modem	**£86.90**

Continued ⟶

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. **All Monitors are supplied complete with BBC connecting leads FREE.**

MICROVITEC 14"

● 1431 – Medium resolution as used on the BBC television computer programme	£175
● 1451 – High resolution, suitable for word processing in mode 0	£225
● 1441 – High res, exceeds the capabilities of the BBC micro	£359
● 1431AP RGB + PAL and AUDIO	£199
● 1451AP RGB + PAL and AUDIO	£255
● **2030 CS 20" Med Res**	£380
● **204 CS 20" Hi Res**	£675
● Dust Cover for Microvitecs	£5.50
● Touchtec 501 Touch Screen	£239

SPECIAL OFFER

This month, we are giving away absolutely FREE, our 14" Swivel Base unit worth £16, with every 14" Microvitec Monitor purchased from us.

KAGA-TAXAN 12"

● TAXAN Super Vision 2 **Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing	£269
● **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue	£319

Philips BM7542 12" Paper White Monitor £75

STAR BUY

- **PHILIPS 14"** Hi-Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono connectors. A push-button switch toggles between Hi-Res monofchrome green text mode and full colour display.

ONLY £199

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	£69
Amber (New Design) Hi-res	£74
LEADS	
BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for KAGA	£3

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress. Our professional type swivel bases have front adjustable control. This alleviates the need to lift the monitor when adjusting the viewing angle.

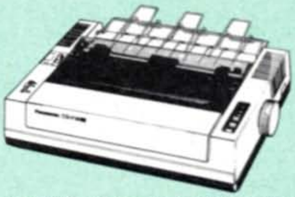
for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

Panasonic KX-P1081



Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy **120 cps** of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £6)

Panasonic KX-P1082

To complement the hugely popular Panasonic KX-P1081, Watford Electronics are proud to announce the launch of Panasonic KX-P1082. This superb letter quality printer has all the features of the KX-P1081, plus a draft speed of 160 cps, making it ideal for high through-put users. This is a similar speed to the Epson LX800, but has an adjustable tractor feed built in and all the incredible facilities of the KX1081, such as variable sized NLQ between 5 and 17 cpi. KX-P1082 represents truly outstanding value at only £175, way below the price of its nearest competition. The price includes a FREE Cable & Dump Out 3 ROM.

Introductory Offer: **£175** (carr. £7)

Panasonic KX-P3131 Daisy-Wheel Printer

This low-cost high-performance Daisy Wheel printer is ideal for anyone wishing to produce clear, immaculate letters or reports. It delivers, flawless text at 10, 12 & 15 CPS. Supports proportional spacing. Is Bi-directional, logic seeking. Printing speed: 17CPS. Has 6k printer Buffer. A printer of similar spec could cost a lot more than our ridiculously low price of:

Only **£239** (carr. £7)

FREE 32K extra Printer Buffer with every KX-P3131 purchased from us this month.

VARIOUS PRINTERS & ACCESSORIES

● Brother HR15 RS232 Daisy Wheel	£275
● Brother HR20 Daisy Wheel	£349
● Epson EX800 Printer	£399
● Epson EX1000 Printer	£545
● Epson FX800 Printer	£295
● Epson FX1000 Printer	£405
● Epson LQ800 Printer	£358
● Epson LQ1000 Printer	£529
● Epson LQ2500 Printer	£790
● Epson LX800 Printer	£180
● Epson SQ2500 Printer	£899
● Epson Paper Roll Holder	£17
● EX800/1000 Colour Option	£55
● EX800/1000 Colour Ribbon	£18
● EX800 Cut Sheet Feeder	£130
● EX1000 Cut Sheet Feeder	£195
● FX/LQ/LX800 Single Sheet Feeder	£135
● FX/LQ1000 Single Sheet Feeder	£169
● Hi-80 Refills – Set of 4 Pens	£7
● LX800 Cut Sheet Feeder	£75
● LQ800 Tractor Feed	£44
● LQ1000 Tractor Feed	£50
● LQ2500 Cut Sheet Feeder	£195
● LX1000 Cut Sheet Feeder	£305
● **Hitachi 672 Colour Plotter**	£495

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£27	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 + 8K Buffer	£75

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer	**£269** (carr £7)
Kaga KP915 Printer	**£350** (carr £7)
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

PRINTER SHARERS

(Ideal for School environment)

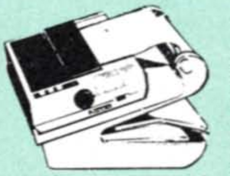
Connects	Serial	Centronics
2 BBC Micros to 1 Printer	£25	£27
3 BBC Micros to 1 Printer	£36	£35
6 BBC Micros to 1 Printer		£99

PRINTER CHANGER

3 Printers to 1 Micro (Centronics) £65

(Cables extra, specify type required when ordering)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

£26 (carr. £2.50)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, Panasonic etc. printers.

Standard length (4 feet long)	**£6**
Extra long (6 feet long)	**£8**
Compact's Special Centronics Lead	**£9**
RS232 Cable	**P.O.A.**
IBM Parallel 1 metre Cable	**£9**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	**Ribbons**	**Dust Covers**
BBC Micro	**–**	**£3.50**
BBC Master	**–**	**£4.00**
Brother HR15/20	**£3.00**	**£5.00**
EX/LQ800	**£7.50**	**£4.50**
EX/LQ1000	**£8.00**	**£5.00**
FX80/85/800/MX80	**£4.00**	**£4.95**
FX100/1000	**£7.00**	**–**
Kaga/Texan KP810/815	**£5.25**	**£4.00**
LQ2500	**£9.00**	**£5.50**
LX80/86/800	**£4.00**	**£4.50**
M1009/GLP	**£4.00**	**£3.75**
Panasonic KX1080/81	**£4.50**	**£4.75**
SQ2500	**£25.00**	**£5.50**
Star NL10	**£4.00**	**£4.50**
Microvitec Metal	**–**	**£5.50**

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	**£7**
2,000 Sheets 9½" × 11" Fanfold Paper	**£12**
1,000 Sheets 15" × 11" Fanfold Paper	**£9**
1000 Sheets true A4 Fanfold Paper	**£11**
2000 Sheets true A4 Fanfold Paper	**£20**
Teleprinter Roll (Econo paper)	**£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	**£5.00**
1,000 90 × 36mm (Twin Row)	**£4.90**
1,000 90 × 49mm (Twin Row)	**£7.50**
1,000 102 × 36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

MEGABUFFER 256

CLEAR
PAUSE/COPY
STATUS EMPTY FULL
256K PRINTER BUFFER

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £125 (carr £2)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

All prices in this advert are exclusive of VAT.

NEW LAUNCH OFFERS

Type DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25 inch disk drive is 40/80 track switchable, and has its very own power supply running independently of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes.

Launch Offer: **£165** carr. £7)

CSPM 400/S DISC DRIVE

A single (1 Megabyte unformatted), double sided, 40/80 track switchable 5¼" disc drive mounted in a BBC Master Plinth (same as DP35-800S) but with a blanking plate to add a second disc drive at a later date. The in-built Power Supply is capable of running two disc drives. The unit is supplied complete with cables and a utilities disc.

Launch Offer: **£139** (carr. £7)

30 Megabyte Winchester Drive

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

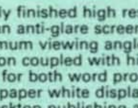
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along wqith a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBC B (with 1770 disc interface).

Launch Offer **£449** (Carr. £12)

Phillips 12" PAPER WHITE Monitor Type BM7542

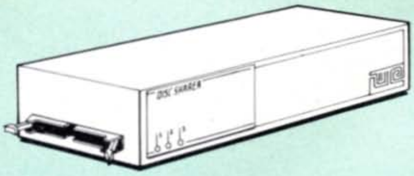


This attractively finished high resolution monitor, has an anti-glare screen and a tilt stand for optimum viewing angle. Its 1000 x 850 pixels resolution coupled with high contrast makes it ideal for both word processing and graphics. The paper white display is especially suitable for desktop publishing and CAD packages. It also has a Video/Audio input.

Only: **£75** (carr. £7)

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not compatible with ADFS.)

Launch Price: **£59** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£46**
- *Acorn's 0.90 DFS Kit complete* **£45**
- *DFS Manual (Comprehensive) (no VAT)* **£6.95**
  (P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

NEW

WATFORD's Mk II Double Density DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

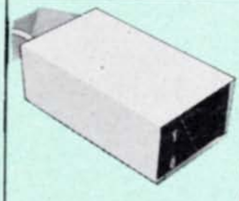
Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

SPECIAL DISC DRIVE/DDFS OFFER

Type CLS400

- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only **£130** (£6 carr)
(Offer valid while stocks last)



3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- Single 400K Drive **£69**
- Twin 800K Drives **£126**

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

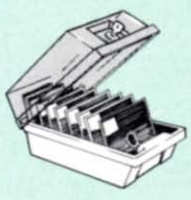
£7

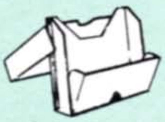
ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**

* Not lockable





PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

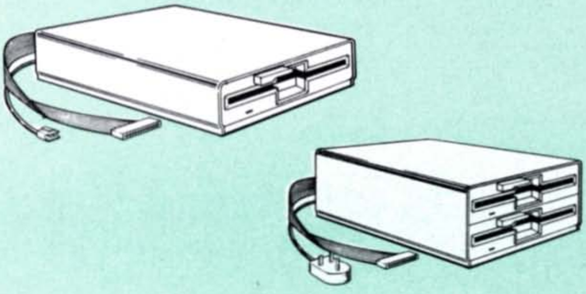
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £89	CLD 400 £168	CS 400S £99	CD400 £188
800K (1.44M)		CLD 800S £169		CD 800S £188

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● *10 × 5¼" S/S D/D 40 Track Diskettes*	***£8.25***
● *10 × 5¼" D/S D/D 40 Track Diskettes*	***£10.20***
● *10 × 5¼" S/S D/D 80 Track Diskettes*	***£12.75***
● *10 × 5¼" D/S D/D 80 Track Diskettes*	***£13***
● *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT*	***£28***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£15***
● *10 × 3½" D/S D/D 40/80 track Discs*	***£19.50***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● *10 × **M3** 3½" D/S D/D 80 Track Discs*	***£18***
● *10 × **M4** 5¼" S/S D/D 40 Track Discs*	***£6.50***
● *10 × **M5** 5¼" D/S D/D 40 Track Discs*	***£8***
● *10 × **M7** 5¼" D/S D/D 80 Track Discs*	***£9***
● *3" Double Sided Discs*	***£3** each*

Special BULK OFFER on 5¼" DISCS

PRICES SLASHED

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48

ACORN WINCHESTER DRIVES

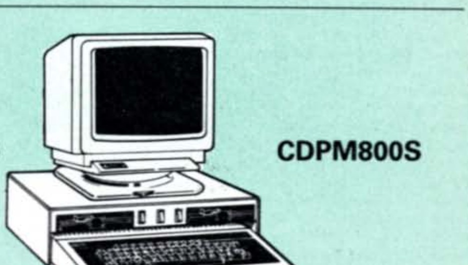
FILESTORE E01	£825
FILESTORE E20	£705
Acorn 30MB Unit incl. Level III Software	£1520

WATFORD's WINCHESTER DRIVES

PRICES SLASHED

● 10 Megabyte Unit with ADFS	**£399**
● 30 Megabyte Unit with ADFS	**£449**
● 40 Megabyte Unit with ADFS	**£749**

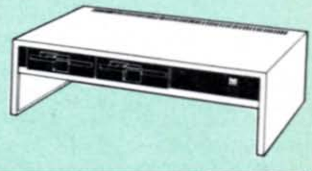
CDP800S **CDPM800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196
(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

ACORN'S Twin 800K Disc Drives



Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.

RRP ~~£350~~

Our Price: Only £182
(carr £7)

Continued →

NOMINATED FOR
BRITISH MICRO COMPUTING AWARDS
1987

QUEST MOUSE

QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and is smooth and easy to use on most work surfaces. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package
With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package. . ."
". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."
"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Cln. C.G. Holton, G2 HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:
- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	***£59***
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	***£85***
QUEST MOUSE ONLY	***£29***
QUEST PAINT SOFTWARE	***£32***
QUEST FONT DISC	***£12***
ConQuest 32K ROM Package	***£29***
QUEST MAT	***£3***
Part-exchange your old Mouse for a New QUEST MOUSE for only	***£23***

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.

2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £19
(Price includes software on Disc)

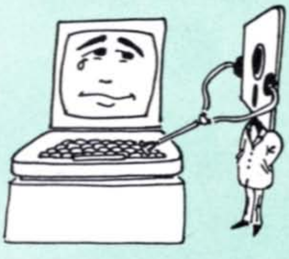
RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	**£59**
RB2 including Quest Paint	**£85**

FLEET STREET EDITOR

Software pack for BBC Micro	**£31**
Software pack for the Master	**£39**
Software Pack for Compact	**£40**
Admin Xtra Disc Utility	**£13**
Walt Disney Disc Utility	**£13**
Fonts N Graphics Disc Utility	**£13**

DIAGNOSTICS DISC



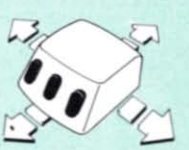
The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

THE AMX MOUSE



ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

AMX MAT	**£3**
AMX MOUSE ONLY	**£29**
AMX DESK Package	**£19**
AMX UTILITY Package	**£11**
AMX SUPERART Package	**£39**
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	**£32**

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	**£9.50**
AMX DESIGN (ROM)	**£59**
AMX 3D ZICON Disc	**£19**
AMX Database Disc	**£19**
AMX XAM Educational	**£15**
AMX MAX A gem of desktop (ROM)	**£15**

TED

THE ULTIMATE TELETEXT SYSTEM

TED is one of a new generation of powerful 32K ROMs for the BBC B, B+ and Master computers and is compatible with disc, tape and network systems. It is in everyday use in schools, colleges and universities, Programmers, Prestel I.P.'s, Micronetters and exhibitors have also found it indispensable.

TED includes the most comprehensive teletext (Mode 7) screen editor ever written for the BBC micro, combining flexibility with ease of use. Its sophisticated facilities include line, column and block copying within AND between frames; text, in a variety of styles and sizes, entered directly from the keyboard; graphics and line drawing modes; search and replace; margins; printer dump routines and a library of in-built icons and typefaces. TED will edit ANY mode 7 screen and can even convert high-res graphics screens to mode 7! Included within the ROM is a fully Epson compatable mode 7 graphics dump routine giving a grey scale printout of exactly what appears on the screen.

Using '*SHOW' (a versatile carousel), collections of mode 7 screens may be 'routed' or displayed sequencially, making it ideal for creating and running 'Viewdata' information systems. Over 1200 frames may bestored on a twin 80 track drive. A unique feture of TED is '*SCROLL', which lets you create pages of up to 600 lines which may be viewed 'Wordwise style', automatically or manually. SHOWs and SCROLLs may be freely mixed and even used from within a BASIC program.

The package comprises a 32K ROM, a 117 page manual, a function-key strip and a demonstration disc containing examples of real-time animation and a sample 55-frame database. A stand-alone machine code routine is provided allowing SHOWs and SCROLLs to be displayed on machines not fitted with TED.

Price: £35

ROM-SPELL

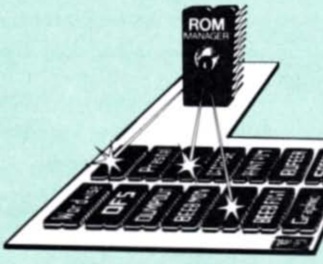
ENGLISH
DICTIONARY
ROMSPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

ROM MANAGER

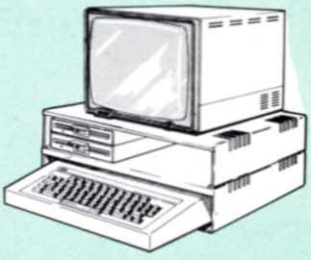


Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

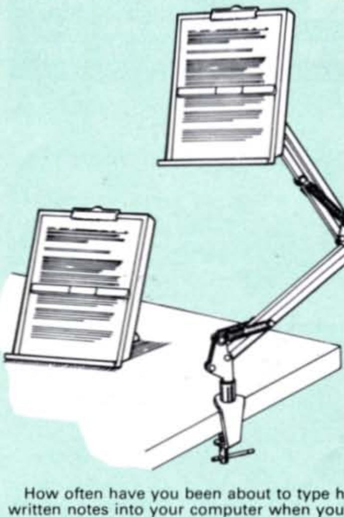
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £3.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£24** (carr £3.00)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

Continued →

ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: **£80** (carr. £2)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

VISA

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

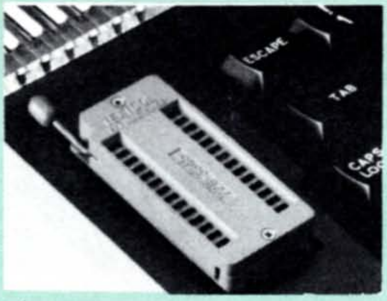
Price:		
Price:	Aries B-12	**£40**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

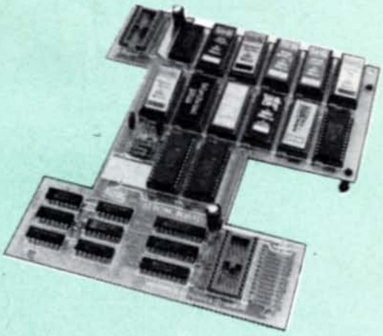
Only: **£24** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

All prices in this advert are exclusive of VAT.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery baskup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

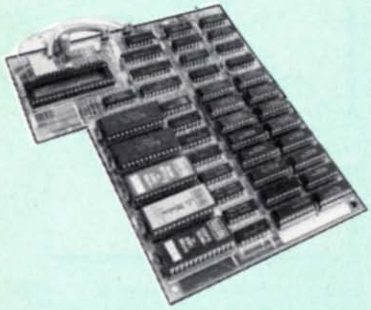
USER PORT SPLITTER UNIT

User Port Splitter
A
B

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£19**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

● *ROM/RAM card with 32k dynamic RAM*	***£39***
● ROM/RAM card with 64k dynamic RAM	***£52***
● ROM/RAM card with a massive 128k dynamic RAM	**£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

● *16k plug-in Static RAM kit*	***£6***
● *16k Dynamic RAM for Upgrade*	***£7.50***
● *Battery backup*	***£3***
● *Read and Write protect switches*	***£2** each*
Complete ROM-RAM board All options installed	***£89***

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £10 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£84***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£82

(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software	**Only £75**
COMMSTAR ROM package only	**£29**

(P&P on modem £3.00)

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£84** **(Carr £3)**

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

Minerva Systems Software

System Delta with Card Index	**£55**
System Programmers Ref. Guide	**£19**
System Gamma	**£43**
System Gamma Prog, Ref, Guide	**£19**
System Mailshot	**£17**
System Reporter	**£17**
System Intrer/View Link	**£17**
System Sales Ledger	**£39**
System Purchase Ledger	**£39**
System Nominal Ledger	**£48**
System Stock Management	**£39**
Order Processing/Invoicing	**£39**

Versatile **BEEB SPEECH SYNTHESISER** Unit

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: **£5**

SPELL MASTER **£45**

Inter SHEET **ONLY £37**

INTER-CHART **ONLY: £26**

Inter-WORD

Only: **£39**

INTERBASE £55

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	**£35**
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£79**
HI-VIEW (for use with 6502 2nd Processor)	**£36**
VIEW Printer Driver Generator (Please specify Disc or Cassette)	**£9**
VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£22**
VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2 for the Master	**£75**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	**£8**
Juki & Brother HR15 (Disc)	**£8**
Silver Reed Printers (Disc)	**£8**

Micros in Business (Disc)

An introduction to Business software for the BBC Micro from Acorn **£43**

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit	£29
Adv 1770 DFS for Mast/Compact	£29
Adv 1770 DFS for BBC/BBC+	£29
Adv Disc Investigator	£24
Adv. Control Panel	£29
Adv. Rom Manager	£13

MINI OFFICE II

Disc Version	£14.50
ROM Version	£48.00

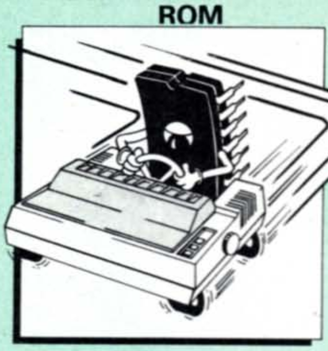
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

EPSON NLQ ROM
for the BBC Micro

Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM **£7**

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- *Vertical and horizontal scaling in all graphics modes and mode 7*
- *Rotation of image by 90, 180 or 270 degrees*
- *Left hand margin setting*
- *Screen dump window setting*
- *Colours appear as grey scale*
- *Two tone fast dump*
- *Colour mask*
- *Mode 7 contrast expansion*
- *Mode 7 contiguous dump*
- *Key triggered and User Port triggered dumps*

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally and compatibles.

Only: £25

(Write in for further details on all above ROMS)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

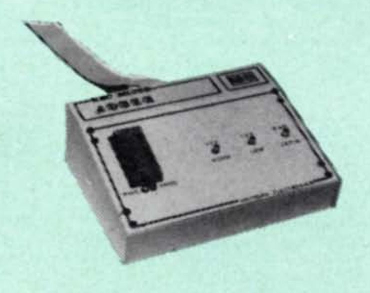
THE NLQ DESIGNER

(The First & still the Best) Supplied with over 25 Different fonts

A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.
Supplied with disc containing over 25 example fonts. (Please specify 40 or 80 track when ordering.) Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM, FONT Disc and Manual **£25**

ADDER



Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

TEX EPROM ERASERS

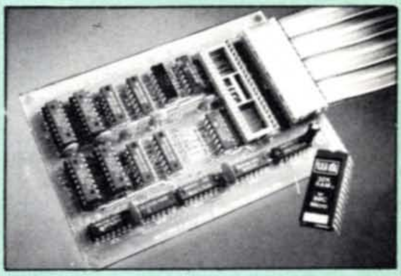
EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued →

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£4.95
15 Hr Wordprocessing BBC/WW & WW+	£4.95
30 Hour BASIC (BBC Micro)	£9.25
40 Best machine Code Routines	£7.95
50 Programs in BBC BASIC	£6.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development Package	£7.50
6502 Reference Guide	£10.95
68000 Assembly Lang Prog.	£19.95
68000 Machine Code Programming	£13.00
68000 Microprocessor Handbook	£14.95
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£16.95
6809 Machine Code Programming	£7.95
8086/8088 Assembly Language Prog.	£11.95
8086/8088 Programming the	£16.95
Advanced Disc User Guide	£16.95
Advanced Prog. Guide to BBC	£9.95
Adv Sideways RAM User Guide	£10.95
Advanced User Guide for BBC	£10.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Amiga Hardware Ref Manual	£23.70
Applied Assembly Lang. for BBC	£9.95
ARM Assem, Lang, Programming	£12.95
Art of Microcomputer Graphics	£15.95
Assembly Language Programming FOR the BBC Micro	£9.50
Assembly Lang. within BBC	£11.95
Basic ROM User Guide	£11.95
BBC B Compendium	£5.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & Small Business	£5.75
BBC Micro & the small Business	£5.75
BBC Micro Advance Programming	£8.95
BBC Micro Basic Sound & Graphics	£7.95
BBC Micro Programming Tips	£8.95
BBC Micro ROM Book	£10.95
BBC Master 128 for High Flyer	£10.95
BBC Micro Disc Companion	£8.95
BBC Software Projects	£6.95
BCPL User Guide	£14
BCPL The Language & its Compiler	£7.95
C for Beginners	£10.95
C for Programmers	£9.95
Complete FORTH	£6.95
Computer Graphics & CAD fundamentals	£9.95
CP-M-86 User's Guide	£19.95
CP-M Bible	£16.50
CP-M Handbook with MPM	£9.95
CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
C Programming Lang.	£23.95
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
DBASE Programming Language	£14.95
dBase III Plus	£12.95
dBase III Tips & Tricks	£14.25
Disc Programming Techniques	£9.95
Exploring FORTH	£6.95
File Handling on BBC Micro	£7.50
FORTH – Advanced	£9.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Guide to BBC ROMs	£9.95
Graphics for Children	£6.95
Hackers Handbook - New	£6.95
Inside Information (Computers, Interfacing & Control o/t BBC Micro	£9.95
Communications & People)	£8.95
Interfacing & Robotics on BBC	£15.95
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing LOGO	£5.95
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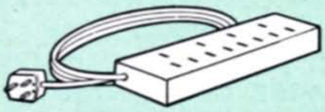

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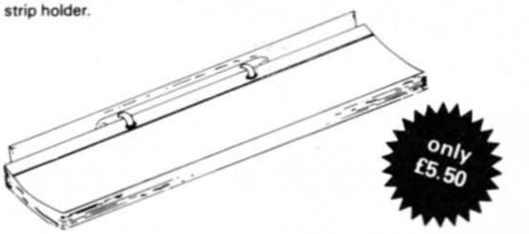

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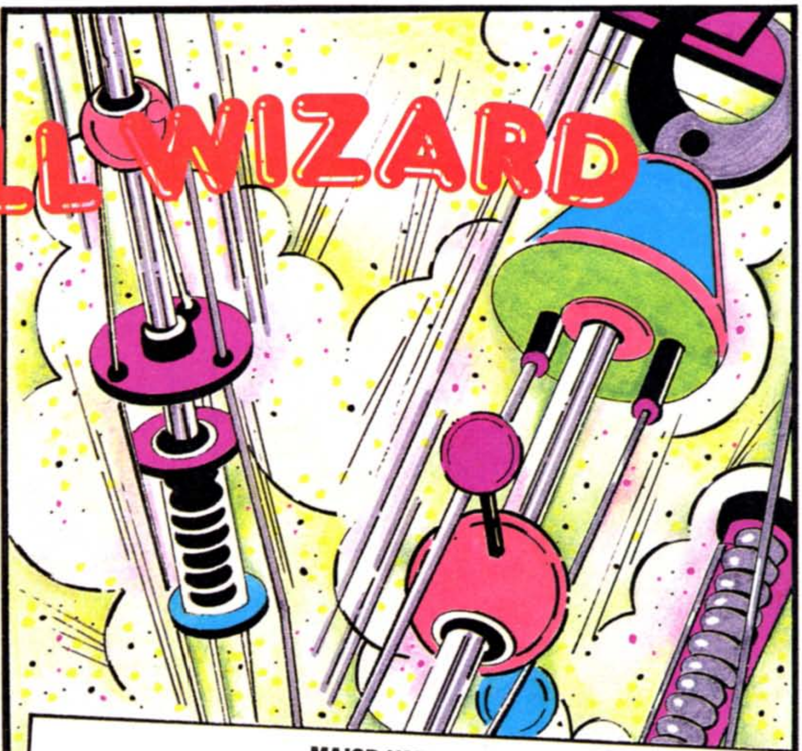


PINBALL is a close simulation of the popular pastime, skill at which was once considered the sign of a mis-spent youth. With this very addictive version you're guaranteed to keep wanting *just one more go* as you try to beat the high score.

It caters for the two joystick fire buttons or keyboard for flipper control – full instructions are given in the program.

The ball follows a proper parabolic arc rather than going in straight lines, so using flippers requires real skill in timing. With practice it is possible to gain a great deal of control over the ball speed and direction.

The occasional apparent dead behaviour of the flippers is deliberate and depends on the ball's direction and speed and how long the flipper has been held up.

When you have been playing Pinball for a while you will notice bars of different colours appearing, depending on which bumpers you've hit. The special high score green and magenta bars are in three segments that have slightly different values.

You can gain free balls by hitting the middle of the magenta section when five out of the six green bars are lit, or by hitting the end sections with at least one part of both green bars lit. There is no limit to the number of free balls you can have.

A high score table is maintained which is automatically kept updated on disc, if you have one. The highest score we've ever achieved so far is more than 53000.

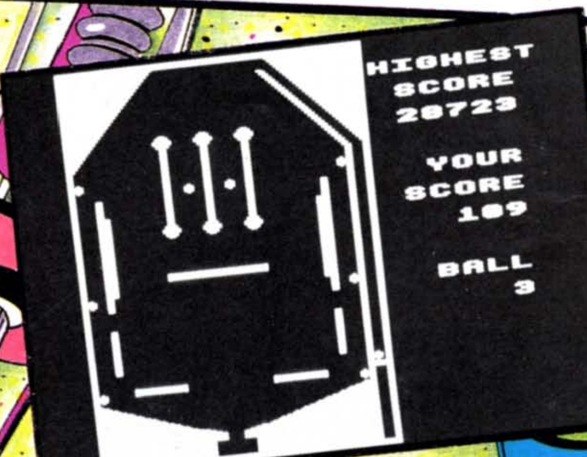
Pinball is a fairly long program. To ensure that there is enough room to run it in Mode 2 it relocates itself down to PAGE=&1300 if necessary and deletes the initialisation routines once they have been run.

Therefore you must make sure you save the program before running it, and don't forget to use Get it Right! to make sure you've typed it in correctly.

Now you've got the game you can really *play a mean pin ball.*

MAJOR VARIABLES

A%	Horizontal ball speed
B%	Vertical ball speed
C%	Colour at *X%,Y%* and bounce PROC number
D%	Ball look-ahead
E%	Left flipper time
F%	Absolute value of *A%*
G%	Absolute value of *B%*
K%	Right flipper time
L%	Filing system flag
M%	Returned value of *A%* from machine code
N%	Returned value of *B%* from machine code
O%	Multiplier code entry
P%	Magenta high score bar counter
Q%	Flipper code entry
S%	Left green high score bar counter
T%	Score table base
U%	Top score
V%	Right Green high score bar counter
W%	Address of PROC poke
X%	Horizontal position of ball
Y%	Vertical position of ball
b%	Ball number
g%	Free ball counter
s%	Current score



HIGHEST
SCORE
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189

BALL
3

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```
   10 REM PINBALL
   20 REM By Terry Blunt
   30 REM (c) The Micro User
   40 ON ERROR GOTO 140
   50 MODE7:PROCinit:RESTORE 2280
   60 I%=2+!&1C AND &FFFF
   70 REPEAT:I%=I%-1
   80 UNTIL I%?-1=&0D:?I%=&FF:!&12=I%+1
   90 *K.9 IF PAGE>&1300:FOR X%=PAGE TO
TOP STEP 4:!(&1300+X%-PAGE)=!X%:NEXT:PAG
E=&1300:OLD|MRUN|M
  100 PRINT '''SPC11"Please wait...";
  110 *FX3,2
  120 *FX138,0,137
  130 END
  140 *FX3,0
  150 GOTO170
  160 DEFPROCZ:PROCM:ENDPROC
  170 @%=5:W%=PAGE
  180 REPEAT:W%=W%+1:UNTIL!W%=&F23A5AF2
  190 W%=W%+4:s%=0
  200 ON ERROR REPORT:PRINT" at ";ERL:EN
D:PROCtable:GOTO170
  210 REPEAT:REPEAT:MODE2
  220 VDU23;&200A;0;0;0;19,2,4;0;19,8,2;
0;19,9,5;0;19,10,1;0;19,11,2;0;19,12,1;0
;19,13,1;0;19,14,5;0;19,15,2;0;
  230 COLOUR8
  240 PRINTTAB(13,2)"HIGHEST"TAB(14,4)"S
CORE"TAB(15,10)"YOUR"TAB(14,12)"SCORE"
  250 VDU5
  260 GCOL0,1
  270 MOVE0,748:MOVE272,1020:PLOT85,0,10
20:MOVE552,1020:MOVE816,756:PLOT85,816,1
020:MOVE760,756:DRAW544,972:MOVE768,756:
DRAW552,972
  280 GCOL0,13
  290 FORX%=0 TO800 STEP32
  300 MOVE0,X%:VDU232:MOVE764,X%-48:VDU2
32:MOVE808,X%:VDU232
  310 NEXT
  320 GCOL0,10
  330 MOVE764,80:MOVE764,180:PLOT85,440,
80:MOVE440,0:PLOT85,764,80:MOVE764,0:PLO
T85,440,0:MOVE0,180:MOVE320,80:PLOT85,0,
80:MOVE0,0:PLOT85,320,80:MOVE320,0:PLOT8
5,0,0
  340 GCOL0,12
  350 MOVE248,1036:PRINTSTRING$(5,CHR$23
1):MOVE288,28:PRINTSTRING$(3,CHR$231):MO
VE312,44:VDU232:MOVE440,44:VDU232:MOVE76
0,28:VDU231
  360 GCOL0,8
  370 MOVE248,612:VDU225:MOVE472,612:VDU
225
  380 FORY%=284 TO684 STEP80
  390 MOVE72,Y%:VDU232:MOVE688,Y%:VDU232
  400 NEXT
  410 GCOL0,7
  420 MOVE360,828:VDU225:MOVE320,718:VDU
226:MOVE432,718:VDU226:MOVE16,216:VDU226
:MOVE736,216:VDU226
  430 GCOL0,6
  440 MOVE248,828:VDU225:MOVE472,828:VDU
225:MOVE16,742:VDU226:MOVE736,742:VDU226
:MOVE248,508:VDU231:MOVE456,508:VDU231
  450 FORX%=120 TO200 STEP80
  460 MOVEX%,228:VDU231:MOVEX%+384,228:V
DU231
  470 NEXT
  480 GCOL0,5
```

```
  490 MOVE360,612:VDU225
  500 GCOL0,4
  510 MOVE256,508:PRINTSTRING$(3,CHR$231
):MOVE448,508:VDU231:MOVE128,228:VDU231,
231:MOVE512,228:VDU231,231
  520 GCOL0,3
  530 FORY%=452 TO676 STEP32
  540 MOVE72,Y%:VDU232
  550 MOVE688,Y%:VDU232
  560 NEXT
  570 FORY%=292 TO356 STEP32
  580 MOVE72,Y%:VDU232
  590 MOVE688,Y%:VDU232
  600 NEXT
  610 FORX%=264 TO488 STEP112
  620 FORY%=640 TO800 STEP32
  630 MOVEX%,Y%:VDU232
  640 NEXT,
  650 GCOL0,2
  660 MOVE296,88:VDU227:MOVE412,88:VDU22
8
  670 s%=0:g%=0:b%=1:P%=0:S%=0:V%=0
  680 GCOL0,5:MOVE16,456:VDU226:MOVE736,
456:VDU226
  690 GCOL0,0:MOVEX%,Y%:VDU226:MOVE160,3
20:VDU226:MOVE592,320:VDU226
  700 MOVE288,488:PRINTSTRING$(3,CHR$231
)
  710 FORI%=480 TO640 STEP32
  720 MOVE92,I%:VDU232:MOVE672,I%:VDU232
  730 NEXT
  740 REPEAT
  750 VDU4:COLOUR8:PRINTTAB(15,18)"BALL

  760 COLOUR3:PRINTTAB(14,6)U%TAB(14,14)
s%
  770 IFb%>5 COLOUR5:PRINTTAB(14,20)b%-5
 ELSEPRINTTAB(14,20)b%
  780 COLOUR3:VDU5
  790 REPEAT:MOVEX%-12,Y%+20:VDU226:GCOL
0,0:MOVE544,1004:VDU232:X%=788:Y%=240:GC
OL0,7:PROCb:GCOL3,7
  800 REPEAT
  810 UNTIL(ADVAL(0)AND3)=1 OR INKEY-97:
TIME=0
  820 REPEAT:PROCb:Y%=Y%-4:PROCb:PROCT
  830 UNTIL(ADVAL(0)AND3)>1 OR INKEY-74
OR Y%<50
  840 PROCb:A%=0:B%=(240-Y%)DIV7+20:Y%=2
40:PROCb:SOUND16,1,2,1:SOUND17,0,200,0
  850 REPEAT
  860 MOVEX%-12,Y%+20:VDU226
  870 X%=X%+A%:Y%=Y%+B%
  880 MOVEX%-12,Y%+20:VDU226
  890 PROCT
  900 IFY%MOD2=0 B%=B%-1
  910 IFY%>988 B%=0 ELSEIFY%>760 A%=-B%:
ELSEA%=0
  920 UNTILX%<540 ORY%<240-B%
  930 UNTILY%>240
  940 GCOL0,6:MOVE544,1004:VDU232:GCOL3,
7:E%=0:K%=0:A%=A%+RND(3)-2
  950 FORI%=0TO65000:IFB%>-28 B%=B%-3 EL
SEB%=-28
  960 FORZ%=0TO1:F%=ABSA%:G%=ABSB%:CALLQ
%:PROCT
  970 MOVEX%-12,Y%+20:VDU226:X%=X%+A%:Y%
=Y%+B%:CALLO%:C%=POINT(X%,Y%):D%=0:IFC%<
1 C%=POINT(X%+M%DIV32,Y%+N%DIV32):D%=1:I
FC%<1 C%=POINT(X%+M%DIV16,Y%+N%DIV16):IF
C%<1 C%=POINT(X%+M%DIV11,Y%+N%DIV11):D%=
2
  980 MOVEX%-12,Y%+20:VDU226:IFY%<161:IF
POINT(X%,Y%-16)=6 PROCQ:C%=0
  990 ?W%=C%+65:PROCZ:NEXT,
 1000 MOVEX%-12,Y%+20:VDU226:X%=-32
 1010 GCOL0,0:MOVE296,88:VDU229:MOVE412,
88:VDU230
 1020 GCOL0,2:MOVE296,88:VDU227:MOVE412,
88:VDU228
 1030 b%=b%+1
 1040 FORA%=240 TO0 STEP-1
 1050 SOUND17,-10,A%,1
 1060 NEXT
 1070 SOUND17,0,0,0
 1080 UNTILb%=6+g%
 1090 VDU4:COLOUR7
 1100 PRINTTAB(15,18)"GAME"TAB(15,20)"OV
ER"TAB(15,24)SPC(4)TAB(15,26)SPC(4)TAB(1
4,28)SPC(5)
 1110 VDU5
 1120 FORB%=0 TO6
 1130 FORA%=240 TO0 STEP-1
 1140 SOUND17,-10,A%,1
 1150 NEXT,
 1160 SOUND17,0,0,0
 1170 IFs%>U%PROChigh
 1180 PROCtable
 1190 UNTILFALSE
 1200 DEFPROCT:REPEATUNTILTIME>4:TIME=0:
ENDPROC
 1210 DEFPROCW:VDU4:PRINTTAB(14,14)s%:VD
U5:GCOL3,7:ENDPROC
 1220 DEFPROCX:SOUND17,1,240,1:s%=s%+1:E
NDPROC
 1230 DEFPROCY:SOUND16,1,3,1:s%=s%+250:E
NDPROC
 1240 DEFPROCa:VDU4:COLOUR5:PRINTTAB(15,
24)"FREE"TAB(15,26)"BALL":SOUND17,1,40,1
 1250 g%=g%+1:IFg%>1 PRINTTAB(14,28)g%
 1260 ENDPROC
 1270 DEFPROCb:MOVEX%-12,Y%:VDU224:MOVEX
%-12,Y%+20:VDU226:ENDPROC
 1280 DEFPROC@:ENDPROC
 1290 DEFPROCA:ENDPROC
 1300 DEFPROCB:C%=A%:IFX%<377 A%=B%:B%=C
%:ENDPROC
 1310 A%=-B%:B%=-C%:ENDPROC
 1320 DEFPROCC:IFD%>1 ENDPROC
 1330 B%=F%:IFB%<8 B%=8
 1340 A%=A%+RND(5)-3:ENDPROC
 1350 DEFPROCD:A%=-A%+RND(3)-2:PROCX:PRO
```

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```
CW:I%=0:ENDPROC
 1360 DEFPROCE:B%=-B%:IFB%>11 B%=B%-1
 1370 PROCX:PROCW:I%=0:IFA%=0 A%=A%+RND(
3)-2
 1380 ENDPROC
 1390 DEFPROCF:s%=s%+100:B%=-B%:IFF%*G%>
200 A%=25*SGNA%:B%=25*SGNB%
 1400 IFX%<80 GCOL3,5:MOVE16,456:VDU226:
MOVE160,320:VDU226
 1410 IFX%>672 GCOL3,5:MOVE736,456:VDU22
6:MOVE592,320:VDU226
 1420 IFP%=0 ANDY%>548 GCOL3,9:MOVE288,4
88:VDU231:MOVE416,488:VDU231:GCOL3,14:MO
VE352,488:VDU231:GCOL0,5:MOVE16,456:VDU2
26:MOVE736,456:VDU226:GCOL0,0:MOVE160,32
0:VDU226:MOVE592,320:VDU226:P%=3
 1430 A%=-A%+RND(5)-3:PROCW:SOUND19,1,16
0,1:ENDPROC
 1440 DEFPROCG:IFY%>160 A%=-18*SGNA%+RND
(3)-2:B%=-18*SGNB%+RND(3)-2:s%=s%+5:PROC
W:SOUND18,1,220,1:ELSEPROCQ
 1450 ENDPROC
 1460 DEFPROCH:s%=s%+50:A%=-A%+RND(3)-2:
IFF%>16 A%=20*SGNA%
 1470 B%=-B%+2:IFG%>16 B%=21*SGNB%+RND(3
)-2
 1480 PROCW:SOUND18,1,180,1:ENDPROC
 1490 DEFPROCI:A%=-A%+RND(5)-3:IFF%>12 A
%=20*SGNA%
 1500 B%=-B%+2:IFG%>12 B%=20*SGNB%
 1510 IFS%=0 ANDX%>200 ANDX%<400 GCOL3,1
1:MOVE92,480:VDU232:MOVE92,512:VDU232:MO
VE92,608:VDU232:MOVE92,640:VDU232:GCOL3,
15:MOVE92,544:VDU232:MOVE92,576:VDU232:S
%=3
 1520 IFV%=0 ANDX%>400 ANDX%<600 GCOL3,1
1:MOVE672,480:VDU232:MOVE672,512:VDU232:
MOVE672,608:VDU232:MOVE672,640:VDU232:GC
OL3,15:MOVE672,544:VDU232:MOVE672,576:VD
U232:V%=3
 1530 s%=s%+10:PROCW:SOUND19,1,200,1:B%=
B%+RND(3)-2:ENDPROC
 1540 DEFPROCJ:A%=-A%+RND(3)-2:IFG%<18 P
ROCX:PROCW:B%=-B%:ENDPROC
 1550 IFS%+V%>4 PROCa
 1560 H%=416:IFX%<400 H%=288
 1570 P%=P%-1:COLOUR3:VDU5:GCOL3,9:MOVEH
%,488:VDU231:A%=20*SGNA%:B%=-20*SGNB%:s%
=s%+200:PROCY:PROCW:ENDPROC
 1580  DEFPROCK:IFD%>1 ENDPROC
 1590 B%=F%DIV3+3:IFX%<377 A%=G%DIV2+3:E
NDPROC
 1600 A%=-G%DIV2-3:ENDPROC
 1610 DEFPROCL:A%=-A%+RND(3)-2:IFF%<18 B
%=-B%:PROCX:PROCW:ENDPROC
 1620 IFX%<400 S%=S%-1:H%=92 ELSEV%=V%-1
:H%=672
 1630 GCOL3,11
 1640 IFY%<576 MOVEH%,480:VDU232:MOVEH%,
512:VDU232
 1650 IFY%>575 MOVEH%,608:VDU232:MOVEH%,
640:VDU232
 1660 A%=20*SGNA%:B%=-20*SGNB%:PROCY:PRO
CW:ENDPROC
 1670 DEFPROCM:IFY%>100 B%=-G% ELSEI%=65
000
 1680 ENDPROC
 1690 DEFPROCN:IFX%<400 A%=F%:ENDPROC
 1700 A%=-F%:ENDPROC
 1710 DEFPROCO:IFG%<18 PROCX:PROCW:A%=-A
%+RND(3)-2:B%=-B%:ENDPROC
 1720 IFS%>0 ANDV%>0 PROCa
 1730 P%=P%-1:COLOUR3:VDU5:GCOL3,14:MOVE
352,488:VDU231:A%=20*SGNA%+RND(3)-2:B%=-
20*SGNB%:s%=s%+250:PROCY:PROCW:ENDPROC
 1740 DEFPROCP:IFF%*G%<200 PROCX:PROCW:A
%=-A%+RND(3)-2:B%=-B%:ENDPROC
 1750 IFX%<400 S%=S%-1:H%=92 ELSEV%=V%-1
:H%=672
 1760 GCOL3,15:MOVEH%,544:VDU232:MOVEH%,
576:VDU232:A%=20*SGNA%+RND(3)-2:B%=-20*S
GNB%:s%=s%+200:PROCY:PROCW:ENDPROC
 1770 DEFPROCQ:IFX%<377 A%=F%:C%=55-E% E
LSEA%=-F%:C%=55-K%
 1780 A%=A%+RND(5)-3:B%=C%
 1790 SOUND16,1,2,1:ENDPROC
 1800 DEFPROCtable
 1810 LOCALf%:*FX15,0
 1820 VDU22,7
 1830 FORI%=1 TO2
 1840 PRINTTAB(6,I%)CHR$134CHR$141"BEST
PINBALL SCORES"
 1850 NEXT
 1860 FORI%=0 TO8
 1870 A%=I%*26+T%:B%=!A%
 1880 IFs%>B% ANDf%=FALSE K%=I%:PROCinse
rt:f%=TRUE:B%=s%
 1890 A%=A%+4
 1900 PRINTTAB(26,I%*2+4)B%TAB(1,I%*2+4)
CHR$129;I%+1CHR$134" "$A%CHR$130
 1910 NEXT
 1920 IFNOTf% PRINTTAB(26,I%*2+4)s%TAB(5
,I%*2+4)CHR$131CHR$136"You scored only"E
LSEIFL%THEN*S.pi A00+100
 1930 s%=0:PROChold
 1940 ENDPROC
 1950 DEFPROCinsert
 1960 FORJ%=8 TOK%STEP-1
 1970 C%=J%*26+T%:D%=C%-26:$C%=$D%
 1980 NEXT
 1990 C%=K%*26+T%:!C%=s%
 2000 PRINT''SPC(7)CHR$133"WHAT IS YOUR
 NAME ?"TAB(25,I%*2+4)CHR$130s%TAB(1,I%*
2+4)CHR$129;I%+1CHR$134" ";
 2010 C%=C%+3:D%=C%+21
 2020 REPEAT
 2030 C%=C%+1
 2040 REPEAT
 2050 IF?C%=127 ANDD%<C%+20 C%=C%-1:VDU1
27
 2060 IFC%>D% C%=C%-1:VDU130,8,127,7
 2070 ?C%=GET:C%?1=32
 2080 IF?C%=13 ANDD%-C%>19 ?C%=127:VDU7
 2090 UNTIL?C%<127
 2100 VDU?C%
 2110 UNTIL?C%=13
 2120 PRINT''SPC(29)
 2130 ENDPROC
 2140 DEFPROChold
 2150 PRINT'SPC3CHR$131"Press any key to
 continue";
 2160 *FX15,0
 2170 A%=GET
 2180 ENDPROC
 2190 DEFPROChigh
 2200 U%=s%
 2210 FORI%=0 TO3
 2220 TIME=0
 2230 SOUND17,-15,40,12:SOUND18,-15,80,1
2:SOUND19,-15,120,12
 2240 REPEAT
 2250 UNTILTIME>80
 2260 NEXT
 2270 ENDPROC
 2280 DEFPROCinit:VDU23;8202;0;0;0;
 2290 FOR I%=0 TO &73 STEP 4
 2300 READI%!&7CA0
 2310 NEXT
 2320 FOR I%=0 TO &73 STEP 4
 2330 READI%!&7E80
 2340 NEXT
 2350 FOR I%=0 TO &A0 STEP &28
 2360 I%!&7F45=&2B2B8789
 2370 NEXT
 2380 FOR I%=0 TO &24 STEP 4
 2390 I%!&7F20=&2B2B2B2B
 2400 I%!&7FC0=&2B2B2B2B
 2410 NEXT
 2420 FOR I%=9 TO 10
 2430 PRINTTAB(9,I%) CHR$141 CHR$134"AN
ORIGINAL GAME"TAB(12,I%+3) CHR$141 CHR$1
34"WRITTEN BY"
 2440 NEXT
 2450 A%=0:Y%=0:L%=USR&FFDA AND &F
 2460 IF L%>3 L%=TRUE ELSE L%=FALSE
 2470 VDU28,2,23,37,21
 2480 IF NOT L% PRINT SPC5 CHR$136 CHR$1
31"STOP THE TAPE-RECORDER"
 2490 O%=&900:T%=&A00
 2500 IF NOT L% GOTO 2540
 2510 F%=OPENUP"pi":IF F%=0 GOTO 2540
 2520 CLOSE#F%:*LOAD pi A00
 2530 GOTO2570
 2540 FOR I%=T% TO T%+208 STEP 26
 2550 !I%=0:$(I%+4)=STRING$(20,".")
 2560 NEXT
 2570 ON ERROR GOTO 2580
 2580 U%=!T%
 2590 ENVELOPE1,0,0,0,0,0,0,0,126,0,0,-2
,126,0
 2600 VDU23,224,0,0,0,0,240,240,240,0
 2610 VDU23,225,48,120,120,252,252,120,1
20,48
 2620 VDU23,226,0,0,0,64,224,224,224,64
 2630 VDU23,227,192,240,252,255,255,255,
255,255
 2640 VDU23,228,3,15,63,255,255,255,255,
255
 2650 VDU23,229,255,255,255,255,255,254,
252,248
 2660 VDU23,230,255,255,255,255,255,127,
63,31
 2670 VDU23,231,0,0,0,0,255,255,255,255
 2680 VDU23,232,192,192,192,192,192,192,
192,192
 2690 PROCwait:CLS
 2700 PRINTTAB(5)CHR$134"DO YOU WANT SOU
ND CUES ?"TAB(12)CHR$134"Y / N";
 2710 *FX210
 2720 IF NOT FNyn THEN *FX210,1
 2730 ON ERROR REPORT:PRINT" at line ";E
RL:END
 2740 CLS:PROCwait:PRINTTAB(6)CHR$134"DO
 YOU HAVE JOYSTICKS ?"TAB(12)CHR$134"Y /
```

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MU2

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```
 N";
 2750 J%=FNyn
 2760 PROCassm
 2770 VDU12,28,0,18,39,9,12
 2780 PRINT'CHR$130"A ball is brought in
to play by working"'CHR$130"the left fli
pper followed by the right."'CHR$130"The
 speed is determined by how quickly"'CHR
$130"you flip the second one."
 2790 PRINT'CHR$130;
 2800 IF J% PRINT"The"CHR$133"FIRE"CHR
$130"buttons work the flippers"'CHR$130"
Master for Left, Slave for Right." ELSEP
RINT"Use"CHR$133"TAB"CHR$130"for the l
eft flipper and"'CHR$133"RETURN"CHR$13
0"for the right flipper."
 2810 VDU28,2,23,37,21
 2820 IF NOT L% PROCwait:PRINTTAB(6,2) C
HR$131"Start the tape-recorder"
 2830 PROChold:ENDPROC
 2840 DEFPROCwait:TIME=0
 2850 REPEATG=INKEY(0):UNTILTIME>100
 2860 SOUND17,1,220,1:ENDPROC
 2870 DEFPROCjoy1:[OPT I%:LDA#&80:LDX#0:
JSR &FFF4:TXA:ROR A:TAX:]:ENDPROC
 2880 DEFPROCjoy2:[OPT I%:TXA:ROR A:]:EN
DPROC
 2890 DEFPROCkey1:[OPT I%:LDA#&81:LDX#15
9:LDY#159:JSR &FFF4:]:ENDPROC
 2900 DEFPROCkey2:[OPT I%:LDA#&81:LDX#18
2:LDY#182:JSR &FFF4:]:ENDPROC
 2910 DEFPROCassm:FOR I%=0 TO 2 STEP 2:P
%=O%:[OPTI%:LDX#7
 2920 .tran:LDA &404,X:STA &434,X:DEX:BP
L tran:LDX#2
 2930 .mult:ASL &434:ROL &435:ROL &436:R
OL &437:ASL &438:ROL &439:ROL &43A:ROL &
43B:DEX:BPL mult:RTS:]
 2940 Q%=P%:IF J% PROCjoy1 ELSE PROCkey1
 2950 [OPT I%:BCS lflip:LDA &414:BEQ lsk
ip:JSR lprint:LDA#0:STA &414:BEQ lskip
 2960 .lflip:LDA &414:CMP#50:BCS lskip:C
MP#0:BNE ltime:JSR lprint
 2970 .ltime:INC &414:INC &414
 2980 .lskip:]
 2990 IF J% PROCjoy2 ELSE PROCkey2
 3000 [OPT I%:BCS rflip:LDA &42C:BEQ rsk
ip:JSR rprint:LDA#0:STA &42C:BEQ rskip
 3010 .rflip:LDA &42C:CMP#50:BCS rskip:C
MP#0:BNE rtime:JSR rprint
 3020 .rtime:INC &42C:INC &42C
 3030 .rskip:RTS
 3040 .lprint:LDY#22
 3050 .lprloop:LDA ldata,Y:JSR &FFEE:DEY
:BPL lprloop:RTS
 3060 .rprint:LDY#22
 3070 .rprloop:LDA rdata,Y:JSR &FFEE:DEY
:BPL rprloop:RTS:]
 3080 IF I%=0 PROCdata
 3090 NEXT:*FX4,1
 3100 *FX16,2
 3110 ENDPROC
 3120 DEFPROCdata:LOCAL I%
 3130 ldata=P%
 3140 FOR I%=P% TO P%+22
 3150 READ ?I%:NEXT
 3160 rdata=P%+23
 3170 FOR I%=rdata TO rdata+22
 3180 READ ?I%:NEXT:ENDPROC
 3190 DEFFNyn:REPEAT
 3200 UNTILINKEY-69 OR INKEY-86
 3210 =INKEY-69
 3220 DATA&9A202093,&20B4A3FF,&20B7EB20,
&B0FF2020,&FF2020B5,&2020B4A3,&20B4A3FE,
&2020FF20,&20FF2020,&20202020,&9A202093,
&20A1ACFF,&20B5EA20,&EDFF2020,&FF2020B5,
&2020B1AC
 3230 DATA&20B5ACFF,&2020FF20,&20FF2020,
&20202020,&20209A93,&202020FF,&20F5FA20,
&A2FF2020,&FF2020B5,&2020A5F0,&20B520FF,
&B0F0FF20,&F0FF2020
 3240 DATA&A3209A92,&A3FFA1FF,&B4A3FFA1,
&FFB4A3FF,&2020B520,&A3FF2020,&2020FFB4,
&FFB520FF,&FFA3B5B0,&202020A1,&20209A92,
&ACFF20FF,&B1ACFF20,&A2B1ACFF,&2020B5AC,
&ACFF2020
 3250 DATA&2020FFB1,&FFB520FF,&FF20B5ED,
&20202020,&20209A92,&F0FF20FF,&B520FFB0,
&E0B520FF,&2020A5F0,&F0FF2020,&B0F0FFA5,
&FFA5F0EF,&FF20B5A2
 3260 DATA 7,3,18,229,0,88,1,40,4,25,6,3
,18,227,0,88,1,40,4,25,2,3,18
 3270 DATA 7,3,18,230,0,88,1,156,4,25,6,
3,18,228,0,88,1,156,4,25,2,3,18
```

This listing is included in this month's tape & disc offer. See order form on Page 165.

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = CA7C C
  50 = EE29 7
  60 = CB3C F
  70 = BFAD 1
  80 = D856 7
  90 = 7AD7 5
 100 = 32FD 5
 110 = 5670 7
 120 = 9F32 9
 130 = FD2E 2
 140 = 7632 7
 150 = 5408 F
 160 = B9A4 9
 170 = 4015 3
 180 = 5AB5 C
 190 = DD64 4
 200 = 9E69 8
 210 = 63C8 5
 220 = 67C4 2
 230 = 7860 1
 240 =  BF5 2
 250 = 667A 0
 260 =  32F C
 270 = 573E B
 280 = 1953 4
 290 = 3A95 C
 300 = 7556 3
 310 = 2C83 A
 320 = 2930 6
 330 = 6BEB 2
 340 =  972 B
 350 = 77B0 4
 360 = 9206 9
 370 =  743 5
 380 = EC2B 5
 390 = E9BF 3
 400 = 2C83 C
 410 = 63E9 4
 420 = BB70 B
 430 = 73C8 6
 440 = 7C58 7
 450 = ADC2 C
 460 = 767A 1
 470 = 2C83 D
 480 = 43AB 8
 490 = 16F3 9
 500 = 538A 9
 510 = 73FD D
 520 = 236D E
 530 = C212 5
 540 = 3D13 8
 550 = 1178 6
 560 = 2C83 C
 570 = C802 3
 580 = 3D13 7
 590 = 1178 1
 600 = 2C83 D
 610 = 90E4 9
 620 = F577 9
 630 = C2E0 5
 640 = 8300 1
 650 = 334C E
 660 = 1B63 A
 670 = 6987 E
 680 = 5B6D F
 690 = B747 C
 700 = 6DE6 F
 710 = 7AF7 F
 720 = 5A9E F
 730 = 2C83 2
 740 = BFBA 8
 750 = 811D 4
 760 = 14F4 8
 770 =  FCC B
 780 =   82 F
 790 = 7C89 0
 800 = BFBA 5
 810 = 8836 1
 820 = 99A3 8
 830 = 270B 1
 840 = A82D D
 850 = BFBA 7
 860 = C269 0
 870 = 92E3 4
 880 = C269 4
 890 = 6FD2 7
 900 = 8FE4 7
 910 = F6C8 6
 920 = 7339 8
 930 =  C73 5
 940 = 7DE0 8
 950 = FCAB B
 960 = 94F2 F
 970 = 4C31 F
 980 = 7007 5
 990 = FCDA A
1000 = 6AD5 B
1010 = 9855 C
1020 = E0AC 0
1030 = AD86 E
1040 = FD73 0
1050 = B9F2 0
1060 = 2C83 B
1070 = 94B8 5
1080 =  8B0 0
1090 = 3306 9
1100 = 7FF1 B
1110 = 667A 6
1120 = 35C0 F
1130 = FD73 E
1140 = B9F2 0
1150 = 8300 6
1160 = 94B8 C
1170 = 101F A
1180 = 2655 0
1190 = E014 5
1200 = 522D D
1210 = DF1C A
1220 = EAD7 E
1230 = DEAD 7
1240 = 33FB 9
1250 = 8071 B
1260 = ED0F 9
1270 = D60D 0
1280 = 7E41 7
1290 = 4971 B
1300 = 2630 4
1310 = 299F 7
1320 = 22FA 7
1330 =  831 C
1340 = 627D B
1350 = 2728 6
1360 = 37A1 1
1370 = CA2D 5
1380 = ED0F 6
1390 = E1FA 4
1400 = 5081 1
1410 = 5995 6
1420 = 4A69 B
1430 = 9BDC E
1440 = B152 D
1450 = ED0F 2
1460 = 1E17 F
1470 = 73D8 F
1480 = E977 0
1490 = D5FD 5
1500 =  F1B 5
1510 = D5E3 C
1520 = D401 5
1530 = 9F67 B
1540 = 94EB 8
1550 = F30B B
1560 = C182 5
1570 = DAA4 6
1580 =  B05 0
1590 = DA17 A
1600 = 4B36 F
1610 = D6DA A
1620 = 92F8 9
1630 = A2CD F
1640 =  159 9
1650 = 8015 5
1660 = 3E5A F
1670 = A257 8
1680 = ED0F E
1690 =  985 F
1700 = CD31 6
1710 = 3260 6
1720 = 74E5 7
1730 = B80E 8
1740 = 3672 5
1750 = 92F8 5
1760 = 8B7B E
1770 = 3315 7
1780 = CAF2 F
1790 = D55C F
1800 = 8D31 4
1810 = 3686 4
1820 = 318E 2
1830 = 48DF A
1840 = D06D D
1850 = 2C83 6
1860 = 9F21 5
1870 = 9209 E
1880 = 8E62 C
1890 = E7C5 5
1900 = 14AB 2
1910 = 2C83 7
1920 = 9C08 9
1930 = 2C3E 3
1940 = ED0F B
1950 = 176E 0
1960 = 79CB D
1970 = 1AC1 B
1980 = 2C83 2
1990 = A1A3 A
2000 = AB4F 2
2010 = B03C B
2020 = BFBA 3
2030 = 3AEB 5
2040 = BFBA 2
2050 = 33D3 0
2060 = 7A82 8
2070 = 1DA9 9
2080 = 2362 2
2090 = F393 4
2100 = 95C8 8
2110 = ECCC F
2120 = 1907 9
2130 = ED0F B
2140 = 980C 6
2150 = A5B6 4
2160 = 6C86 E
2170 = E398 7
2180 = ED0F F
2190 = 37DA 1
2200 = 1357 2
2210 = 2E4A C
2220 = 173E B
2230 = 6DAC 0
2240 = BFBA D
2250 = CACC 9
2260 = 2C83 6
2270 = ED0F 0
2280 = B0D6 3
2290 = ED35 A
2300 =  5AB 4
2310 = 2C83 6
2320 = ED35 4
2330 =  5CA A
2340 = 2C83 C
2350 = 11F2 7
2360 = 73D1 F
2370 = 2C83 9
2380 = C9E0 C
2390 = 8A85 0
2400 =  D40 B
2410 = 2C83 A
2420 = A65F 0
2430 =  457 5
2440 = 2C83 D
2450 = D9B9 0
2460 = 7E5C 4
2470 = EE2B 6
2480 = E55B 7
2490 =  9FF A
2500 = CC7F E
2510 = E5BC B
2520 = EB42 9
2530 = 7562 6
2540 = AC7D 3
2550 = 273A 3
2560 = 2C83 A
2570 = 672A 6
2580 =  A53 E
2590 = 8CC6 4
2600 = 7C75 E
2610 = 2E6D 7
2620 = 87B2 7
2630 = 821C 7
2640 = C75E 8
2650 = 2432 B
2660 = 7B4A 4
2670 = 3B05 1
2680 = A025 5
2690 = 4F0E 4
2700 = B914 B
2710 = 342D 4
2720 = 8B52 4
2730 = 3987 8
2740 = 70F0 E
2750 = 8C6B B
2760 = 35EA 7
2770 = ABF5 E
2780 = D5B7 2
2790 = 21F1 1
2800 = CAE8 9
2810 = EE2B D
2820 = 3624 E
2830 = 371E 2
2840 = F4E4 4
2850 = BC1A 2
2860 = C76F 4
2870 = A323 1
2880 =  FF6 1
2890 = 1298 3
2900 = 5D9C 8
2910 = DF00 D
2920 = FC00 6
2930 = 5095 8
2940 = A307 C
2950 = 61A4 3
2960 = DB9A A
2970 = 83C3 6
2980 = 69FC F
2990 = D682 9
3000 = 65E7 4
3010 = 2850 8
3020 =  537 D
3030 = 3B74 6
3040 = BE55 2
3050 = 497D C
3060 = 2CD0 9
3070 = DEE7 1
3080 = BCDE C
3090 = 6F1D A
3100 = 1594 8
3110 = ED0F F
3120 = 4417 B
3130 = B201 6
3140 = B927 E
3150 = 9D05 7
3160 = B619 9
3170 = 6997 F
3180 = 3943 2
3190 = 2D19 9
3200 = 8E47 D
3210 = 2CA5 F
3220 = B643 D
3230 = 32F1 7
3240 = 414E F
3250 = 80B9 8
3260 = B09C 9
3270 =  4D6 1
```

TubeLink

What is Advanced BASIC? Advanced BASIC is a new version of BASIC for the BBC micro models B/B+/Master/Electron - the most powerful BASIC ever written for a 6502 based micro, enabling you to take advantage of many of the facilities offered by Acorn's BASIC V (Archimedes BASIC), along with many additional features for programmers. **Will Advanced BASIC run on my machine?** Advanced BASIC is fully compatible with the BBC micro models B, B+, B+128, Master, and Electron. To use Advanced BASIC you will require a second processor; either Acorn 6502/65C02 second processor, Turbo (65C102) co-processor, PMS B2P or PMS E2P. Advanced BASIC is suitable for all known makes of sideways RAM, shadow RAM, ROM extension boards, DFS, ADFS, and Econet. **What advantages does Advanced BASIC have over my existing BASIC?** Here are some of Advanced BASIC's exciting features...

- Over 35 new keywords
- New multi-line program loop structures (CASE, WHILE, etc)
- New graphics statements (ELLIPSE, RECTANGLE, etc)
- New error handling and TRACE debugging facilities
- Instant on-screen HELP for keywords and BASIC programs
- Mouse support (use new MOUSE keyword)
- Function and procedure libraries
- Acorn's fastest and most accurate 1987 Hi-BASIC included
- Extended features for assembler programmers
- Comprehensive 56pp user guide
- Programming utilities and file transfer software
- Keyword and token-compatible with Acorn BASIC V
- Programs will run on Archimedes without modification

What do the magazines say about Advanced BASIC? *"Once you've started using Advanced BASIC you won't want to go back to the old one... I thoroughly recommend it as a valuable programming tool."* Micro User (January 1988) *"Using Advanced BASIC is most addictive - all those extra commands and facilities enable quite complex BASIC to be written with as little fuss as possible."* BEEBUG (November 1987)

The Advanced BASIC system disc contains over 80k of code, including the very latest version of Acorn's HiBASIC under license, the Advanced BASIC ROM image, mouse drivers, example programs, and utilities. Advanced BASIC is available on 16k EPROM or disc for sideways RAM users. Both packs contain the 56pp user guide and 40/80 track system disc described above.

Advanced BASIC on 5.25" disc £29.95 • EPROM £34.95 • Advanced BASIC (Electron ROM) £24.95 (state 3.5" or 5.25" disc)

Acorn's 1987 Hi-BASIC for BBC B/B+/Master Available under license from Acorn, Tubelink are able to supply the very latest version of HiBASIC which offers considerable speed and accuracy improvements over the previous versions. Available on 40/80T disc or 16k EPROM. (Supplied FREE with Advanced BASIC package) • £9.95 disc • £14.95 EPROM

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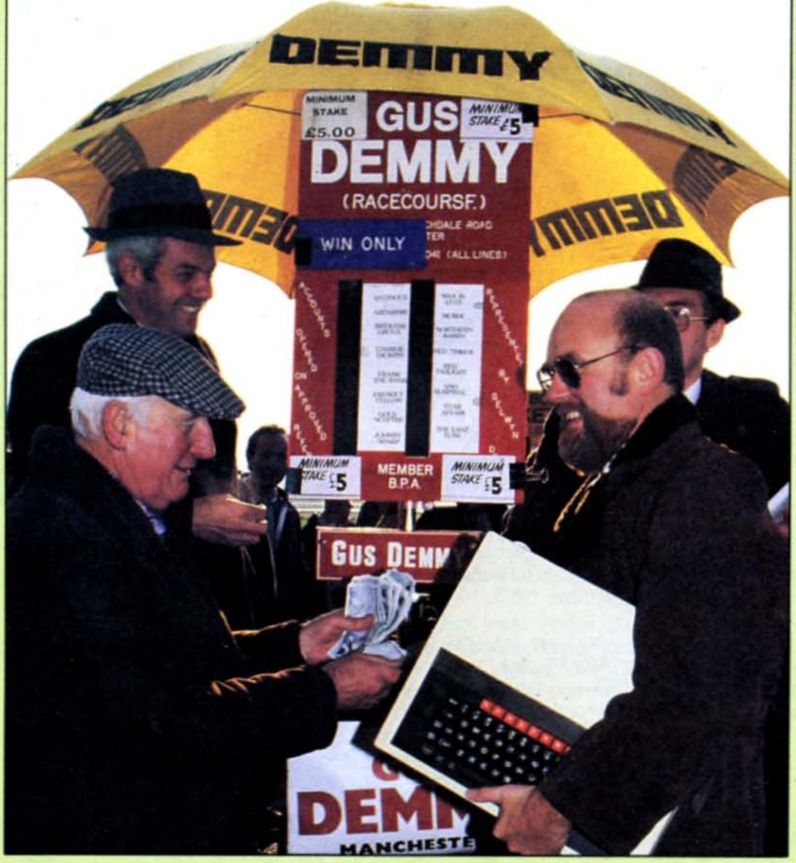
Mike Cowley hedges his bets to gamble with Pro-Punter

Can you beat the bookie?



THE quest for a system to beat the bookmaker is the gambler's equivalent of the wealthy middle-aged matron's search for the elixir of youth.

A variety of self-styled experts over the years have insisted that they – and they alone – have the answer. And all have eventually disappeared leaving those that believed in them with considerably lighter wallets.

Yet racing columnists still regularly risk their reputations in this area, television commentators spew out endless selections and in every pub in the country there's at least one cloth-capped pundit who'll gladly tell you about a good thing running that day.

But, overall, the end result is that turf accountants drive even more ostentatious limousines and chomp away on ever more expensive Havana cigars.

However, all that may be about to change thanks to the BBC Micro and a schoolteacher from Ashton-under-Lyne, Lancashire. For Dave Atherton has developed a program which appears to have the potential to turn bookie-bashing into an art form.

Known as Pro-Punter, it has already had some truly amazing results. Over a six month period which ended recently, a level stake of £10 produced a clear profit of £511.99. Pro-Punter selected 36 winners out of a total of 73 races, a strike-rate of 49 per cent.

All these were "proofed" not only by the Raceform Handicap Book and The Sporting Life, the bibles of the industry, but also by *The Micro User*. This vetting involved receiving selections time-franked at the Post Office before start of racing.

Pro-Punter's performance to date then is to gambling what Nijinksy was to thoroughbred racing itself – seemingly unbeatable.

There is not one professional tipster who can legitimately claim this success rate – including household names like Peter O'Sullivan.

Yet Pro-Punter has been written by a man who had never had a bet in his life before he started to develop the program three years ago.

In fact, if Dave Atherton hadn't had a former apprentice jockey living next door to him, the package would never have seen the light of day. "He got me interested and it all stemmed from there", recalls Dave.

But what really prompted him to attempt to develop a beat-the-bookies program was a news item in *The Micro User*. "There was a write up on a rather crude betting program" he recalled. "And the more I thought about it, the more I felt I could do better".

So the English teacher at a school for the physically handicapped underwent a voluntary transformation in his life style.

He began to frequent race tracks and betting shops, rubbing shoulders with Runyonesque characters to familiarise himself with race track terminology.

Form – the detailed information on past performances by a particular horse and on which its potential is assessed for the next race – became his overriding passion.

"I had to learn a whole new language", says Dave Atherton, "words like hotpot – a heavily backed favourite – and Yankee – a multiple bet – have to enter your vocabulary. It was like going back to school all over again".

Once his education was almost complete – "You'll never actually learn everything", he says – he began to translate his new-found knowledge into what was eventually to evolve as Pro-Punter.

"What we've ended up with is an expert system investment adviser geared to provide a profit", says Dave. "What the bookmakers fear most are the punters that have a few selective bets and come out on top. If you use Pro-Punter properly, rigidly following the investment advice, this is what you'll be doing".

But how effective is Pro-Punter? Only your average gambler would know for sure. Well that's where I came in . . .

Ever since I placed half a crown (12.5p) on a grey horse in a point to point at Cartmel, I have sought the key to caning the bookie.

It might have been different if it hadn't have romped home at 8 to 1, which provided me with a princely profit of £1.

Being only seven years old at the time, to have actually lost a week's pocket money might have been sufficient to put me off the sport of kings for life.

However, the moment that Honest Harry Hinds (how could you forget a name with alliteration like that) handed over my winnings to my father – even in those days bookies were loath to have kids in short trousers as customers – I was hooked.

Since then the quest for easy money has taken me as far afield as the Garrison Racetrack in Barbados. The only reason I recall this – apart from a natural desire to name drop – is that was the first time I was absolutely convinced I had the bookies on the run.

By virtue of my press card, I found myself in the paddock as the horses paraded around. I could hardly contain myself when I recognised one of them – the jockey that is, not the horse – from a party the previous evening.

Joy turned to positive rapture when he leaned towards me, winked and whispered: "Get your money on this". Well, in racing they say forget about getting it from the horse's mouth, just hear it from the jockey.

Literally everything I had went on the nose of Sweet Delight.

It never even passed the winning post. The poor unfortunate animal stuck its foot in a hole, broke its leg and had to be shot. If I could have found the jockey a similar fate would have been in store for him.

Unfortunately – like most gamblers – these salutary lessons are rarely enough to deter me from the next "investment". That's why I welcomed Pro-Punter with all the enthusiasm of a castaway glimpsing a ship on the distant horizon.

The verdict? After comparing Pro-Punter with my own selections for one month, the package had seven out of ten winners to my two.

Bookies beware. Pro-Punter is under starter's orders and Dave Atherton is on to a winner . . .

Pro-Punter, like all expert systems, is a package which deals with a particular problem – in this case how to invest wisely in horse racing.

It uses its knowledge base to answer two specific questions. Is there an outstanding horse in a race and, if so, is it worth a bet?

BBC Micro owners who fancy a flutter with Pro-Punter will need not only a disc drive but also the ability to find their way around the racing press.

The Sporting Life, the best known of the papers that serves the gambling fraternity, will provide a more than adequate source of data to input.

And part of the well written instruction manual which accompanies Pro-Punter covers the complexities of racing jargon for the novice gambler.

It takes you step by step through what regular readers of the racing papers take for granted.

You are also led through an interconnected suite of programs, answering questions about the race under analysis and entering relevant data.

What Pro-Punter needs to be fed is statistical information – better known in the racing world as form. This can range from details of a horse's last run, through weight and speed ratings to breeding.

One of the problems is that keying in such information for each race can take up to half an hour.

The first skill to acquire then lies in selecting races. Aim for ones with only a few runners where there's lots of information available.

After the input stage, the program takes between two to three minutes to make its calculations. It assesses among other factors, weight carried, whether the horse likes the particular course and prevailing weather conditions, class, speed and even which stall the horse will come out of at the start.

Pro-Punter finally forecasts a finishing order for the race – up to 12 in large fields – producing a rating for each horse and a computer-generated starting price which reflects its own view of the horse's chances.

It also assesses the odds (the price) being offered by bookmakers before coming up with investment advice.

In many cases, it will recommend that people do not bet on a race, even where a horse is shown to have a good chance. That "No Bet" decision is often based on the program considering that the potential return on outlay being offered by the bookie is too low.

"Pro-Punter is an extremely cautious investor", says author Atherton. "It won't advise you to risk your money unless there's a very good chance of financial gain.

"Considering what's been happening on the stock market of late, I think it can claim to offer better advice than most stockbrokers".

Pro-Punter technically is a first class package, with excellent presentation, thanks to attractive screen displays.

And it is user friendly. Recognising it may be somewhat of a chore to enter data in five stages, at the end of part four the message "Nearly there . . ." appears on screen.

The only operational snag appears to be that it requires Basic 2 or higher and you are warned to turn off all surplus roms to avoid conflict with the protection mechanisms.

Just how Pro-Punter processes the information is a closely guarded secret.

However, judging by the results to date, it is considerably more sophisticated than sticking a pin in the racecard.

Product: Pro-Punter
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Winchester Disk Drives

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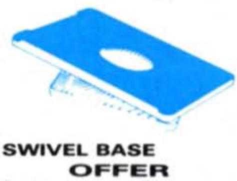

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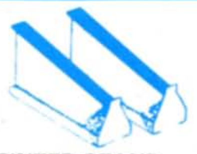

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Ribbon	£8.00
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Serial I/F	£85.00
Sheet Feeder	£55.00
Ribbon	£5.50
STAR ND15	£469.00
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Sheet Feeder	£140.00
Ribbon	£8.00
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STAR NR15	£559.00
Serial I/F	£85.00
Sheet Feeder	£140.00
Ribbon	£8.00
Font Cartridge	£40.00
STAR NR10	£429.00
Serial I/F	£85.00
Sheet Feeder	£55.00
Ribbon	£5.50
STAR NB15	£799.00
Serial I/F	£85.00
Sheet Feeder	£140.00
Ribbon	£8.00
Font cartridge	£40.00
STAR NB24-15	£759.00
Serial I/F	£85.00
Sheet Feeder	£195.00
2nd Bin	£125.00
Font Cartridge	£40.00
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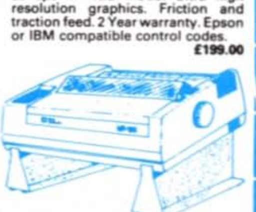
200 cps in draft. 40 cps in NLQ mode. 7K buffer as standard (128 downloadable characters in NLQ) optional 8K memory. IC font cards. **£274.85**

MICRO P MP165

80 Columns. 165 cps in draft mode. 35 cps in NLQ mode. Ultra high resolution graphics. Friction and traction feed. 2 Year warranty. Epson or IBM compatible control codes. **£199.00**



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PINWRITER. High speed draft 168 cps. Standard draft 140 cps. Letter Quality 56 cps. You have to see it to believe it.

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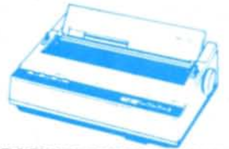
P7/CP7 Cur Sheet Feeder	£266.00

DAISYWHEEL



PANASONIC KX-P3131

A Fully Formed Serial Impact Daisywheel printer with print speed of 17cps. Diablo compatible print wheels. Print pitches available are: 10, 12, 15 and proportional spacing. Standard friction feed and optional tractor. Paper width 13.5 inches. Standard Centronics optional RS-232C. Built with 6K text buffer expandable to 32K buffer. **£289.00**

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The new Brother Daisywheel HR 20 8K standard buffer upgradable to 16k. Comes standard with serial and parallel port **£389.00**

JUKI Daisywheel

Juki 6100 **£329.00**

NEW MP26 Daisywheel

MP26 A feature rich very quiet printer. Universal compatibility with almost all personal computers at an unbeatable price. Speed: 26 cps. 132 columns Diablo 630 compatible **£249.00**

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MP40

A very fast, quiet printer with features compatible with virtually all computers at a fantastic price. 40 cps, 132 column, diablo 630 interfacew, parallel interface, built in standard RS232 optional **£355.00**

GAKKEN GPR-2000

Print speed of 18 characters per second. Fully Qume compatible. Takes Qume exchangable Daisywheel and ribbons. Selectable 10,12 & 15 pitch. Supports proportional spacing. Standard friction feed. Tractor/cut sheet feeder and serial interface optional. **£169.00**

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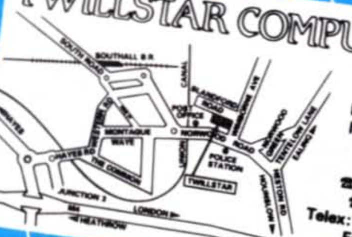

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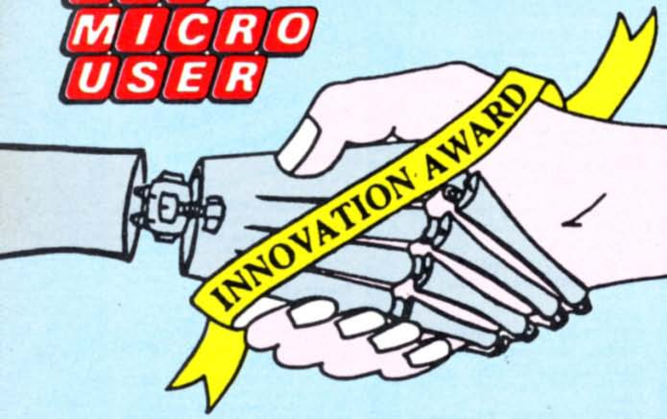


The Micro User Innovation Award 1987 captured not only the imagination of our readers but created a wave of interest nationwide.

In all, more than 200 newspapers – dailies, evening and weekly – carried stories about the finalists in the run up to judging.

And one joint entry – from a school in East Anglia – even resulted in a television crew waiting with the students involved on the morning the winner was announced.

Identity check was winner

THE worldwide search for the most innovative use of a BBC Micro drew to a nailbiting conclusion in London recently.

It was there – on the opening day of the Electron & BBC Micro User Show – that an engineer from West Bridgford, Nottinghamshire, was named the overall winner.

Joe Rice carried off the top prize of a £1,000 Archimedes computer in the face of intense competition from more than 500 entrants from as far afield as Australia and New Zealand.

He captured The Micro User Innovation Award 1987 when a distinguished panel of judges hailed his development of a revolutionary personal identification technique using a BBC Micro as a major breakthrough.

Known as Veincheck, it is a security device which identifies people by the number, size and position of subcutaneous blood vessels on the back of their hands.

As the arrangement of veins is as unique to an individual as a fingerprint, it makes people "machine readable" in that it can serve as their personal bar code.

Identification is performed by means of a detector which scans the skin and locates the blood vessels by measurement of the reduction in reflected infrared radiation.

Then comparison of the measured pattern with a previously recorded file provides verification of the individual.

It is currently being viewed as one way to eliminate the theft of credit cards – with the thief obviously being unable to overcome the Veincheck factor.

Joe Rice will be more than delighted if this happens. For it was the theft of his own credit cards which spurred him on the develop the device.

"I was so annoyed by the fact that my cards had been stolen and how easy it was then to use them that I decided to do something about it", he told *The Micro User*.

Veincheck data can now be compressed to less than 40 bytes and stored on current generation credit cards.

User registration will be by local cash dispensers modified to write personal vein characteristics on all credit and cash cards.

The development is also on the verge of assisting with the security of what is expected to be the credit cards of the future.

These will arrive in the form of what appear to be blank cards, but which can be activated to store memory for brief periods of time.

All the user needs to do is take the card from his wallet, run it over the back of his hand and in-built sensors will pick up the vein pattern. Then it can be used like a key for a car or house, with the owner's vein pattern already encrypted in the lock, verifying his or her identity.

Veincheck also has military potential which almost prevented it seeing light of day. For the Ministry of Defence slapped a secrecy order on the device when it first heard about it.

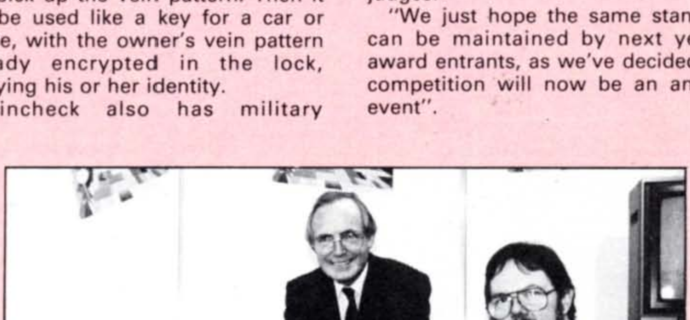
It took a number of letters from Joe Rice to his MP before this was lifted.

Now the British Technology Group has announced it will back the invention and is currently concluding a licensing agreement with a major international company.

"The Micro User Innovation Award 1987 produced entries of a far higher standard than even we expected", said Derek Meakin, Managing Editor of *The Micro User* and chairman of the juding panel.

"However, Veincheck did stand out as a marvellous example of British inventiveness which eventually resulted in a unanimous decision by the judges.

"We just hope the same standard can be maintained by next year's award entrants, as we've decided the competition will now be an annual event".



Joe Rice, winner of The Micro User Innovation Award 1987, pictured with Derek Meakin, Managing Editor, and the £1,000 Archimedes prize

Flood of high quality entries

THERE could only be one winner in the first ever Innovation Award competition organised by *The Micro User*.

But that takes nothing away from the remainder of the hundreds of entries which flooded in from all over the world.

And in particular the handful that were just a whisker away from winning the £1,000 Archimedes that went to Notts inventor Joe Rice.

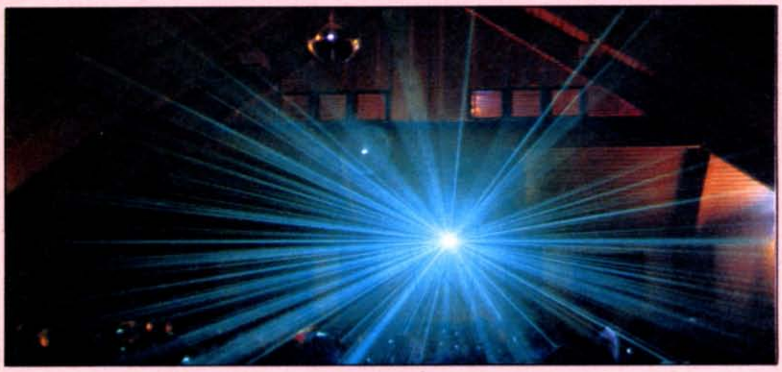
In the words of one of the judges: "The standard of entries was extremely high and when we got down to the final 20 or so it was almost impossible to choose between them.

"The fact that Mr Rice won the Archimedes owed more to our need to pick a winner than to his entry outshining all the others".

Not surprisingly, perhaps, medical applications featured heavily among the "best of the rest".

But there was still room for the student who organises his life on a BBC Micro, a safety and maintenance program for helicopters devised by a consultant engineer, computerised laser light shows from 21-year-old twins, and the contest's youngest entrants – a pair of pre-teen publishers.

● *Details of the 1988 award can be obtained by phoning 0625 878888.*



Laser control

Twin brothers David and Derek Rose of Banbury have discovered the sky's the limit for the BBC Micro.

The 21-year-old maintenance fitters use the machine to control the spectacular laser light shows they provide for private functions in the Oxfordshire area.

Their greatly expanded BBC Micro calculates and sends analogue signals to a remote laser scanning head which they built themselves.

It houses the laser and beam-pointing equipment which can draw any desired pattern or graphic by steering the laser beam along a path calculated by the computer.

The scanning device has a very fast response and is driven using a machine code program which projects the graphic without flicker.

Routines written by the brothers rotate, spin, tumble, grow, rove and animate the graphics to provide a truly dynamic effect at parties.

Messages can be typed in and then scrolled across the projection area – much to the delight of spectators.

Copter check

A helicopter rotor diagnostic package which embodies human expertise within a suite of BBC Master software was entered by Southampton engineering consultant Dr Mike Andrew.

Utilising airframe vibration measurements and helicopter rotor blade positonal data, the computer undertakes an automatic assessment of the maintenance condition of the main rotor.

When it discovers a situation requiring attention it presents on-screen the necessary remedial actions.

The system uses unique search, decision-making and diagnostic strategies so that remedial action can be successfully defined even when portions of the data are erroneous.

Used by the Royal Navy on a daily basis to service its Lynx helicopters, Dr Andrew's system has resulted in significant cost and maintenance time savings.

Sugar monitor

How diabetics can use a BBC Micro to monitor their sugar levels and remedy any imbalance was demonstrated by the entry from B.I. Hall of Maidstone.

His program processes one month's data on glucose and sugar levels in blood or urine and plots processed data to illustrate diabetic control efficiency and trends.

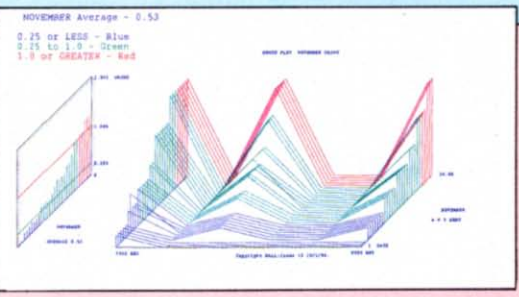
It provides both hard copy and graphical display in the form of charts. All data is stored on tape for later retrieval.

It also calculates a monthly average which would otherwise require a blood test.

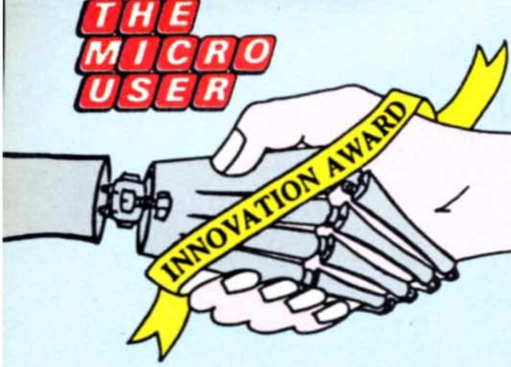
The program is controlled by simple menu options, each protected by input error traps. After identification, the user is asked to select blood or urine analysis followed by data in chronological order.

In the absence of data, zero is assumed for urine and the previous month's average for blood. At the end of three months' input sequence a further menu is offered to print, store, plot or erase the data.

To enhance presentation the hard copy is printed in different colours as preset thresholds are exceeded. The colours culminate in red to emphasise dangerously high levels of sugar, alerting the user to potential control problems.



Hardcopy output from one months data



An eye on the home

West Sussex student Alexander Aftandilian employs his BBC Micro to help him run his home environment.

The machine receives daily weather information and automatically turns the central heating up or down accordingly.

It is also linked to the main fuse box and can turn appliances and lights on or off – and even pinpoint spent light bulbs.

Alexander's program enables the BBC Micro to plan his out-of-town travel, sounding an alarm 10 minutes before he has to leave the house.

Getting over amnesia

Bristol neuropsychologist Dr Seldon Curry developed a home-based rehabilitation programme to assist patients with severe head injuries to make a full and speedy recovery.

Patients either enter the programme as soon as possible after their accident – usually on emerging from a post-traumatic amnesia of at least a week – or after several years of recovery.

The basic idea of cognitive rehabilitation is provision of a structured and progressive set of stimulating and intellectually challenging material designed to exercise the more general areas of cognitive impairment following cerebral trauma.

These areas include attention span, attentional control, impoverished memory, slowness, logical problem-solving, and so forth.

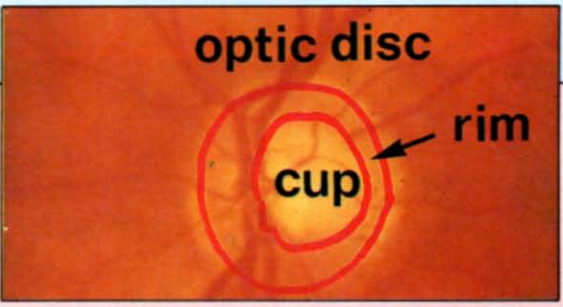
Dr Curry decided to present this material via a small, relatively inexpensive computer, so that the rehabilitation programme could be primarily home-based.

Patients use their own – or a loaned – BBC Micro, Master or Compact, and are provided with the necessary peripheral equipment including hi-res colour monitor and modem.

A network system was developed allowing each of the remote machines in patients' homes to be linked to a central computer at the Burden Neurological Institute in Bristol using modems.

The network system provides both continuous control over the patient's rehabilitation programme and complete monitoring of his or her performance.

The electronic mail link is only connected for the transmission of programs and receipt of results, which ensures that telephone charges don't become unreasonable.



Monitoring the eye

Doctors Brian Hayes and Fred Fitzke – of the department of visual science, Institute of Ophthalmology in London – wrote image analysis software for the BBC Micro and digitiser tablet to undertake research into the eye disease glaucoma.

Glaucoma causes a rise in pressure within the eye which kills nerve fibres carrying the visual messages to the brain, causing areas of blindness to develop.

By measuring the nerve fibres, doctors Hayes and Fitzke can plot the course of the disease and the effects of treatments.

Photographs of the optic disc – the beginning of the optic nerve – are traced with the digitiser tablet and their x,y coordinates recorded on disc. The doctors can then correct or print out the tracings.

The computer calculates the diameters of the optic disc and its central cup from their maximum diameters in 30 orientations.

The area of the rim of nerve fibres is found from the disc minus cup area. Areas are found by summing a series of trapezoidal areas between the tracing and the x axis.

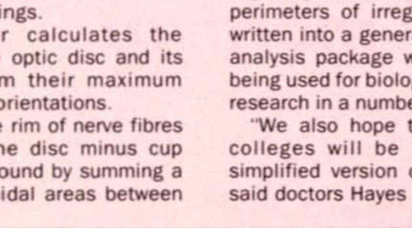
The mean width of the rim of nerve fibres is measured by storing the outer and inner margins of the rim in two arrays and calculating the minimum distance between each x,y coordinate in the outer margin and every x,y coordinate in the inner margin.

Finally the computer draws a polar-histogram from the stored width measurements which shows where the rim of nerve fibres is narrowed – the part of the visual field affected by the eye disease.

Comparison with previous measurements shows the progress of the disease and the effect of the treatment.

Software for digitising and measuring lengths, diameters, areas and perimeters of irregular shapes was written into a general purpose image analysis package which is currently being used for biological and medical research in a number of laboratories.

"We also hope that schools and colleges will be interested in a simplified version of the software", said doctors Hayes and Fitzke.



Results of an eye scan

Micro checks arteries

A new service is being set up at Guy's Hospital in London, aimed at reducing the time, expense and risk involved in surgical replacement of severely constricted arteries.

And a BBC Micro is at the "heart" of this entry from senior scientific officer David King.

The computer is the first step in the process, being used to pinpoint significant narrowing in the complicated arrangement of "pipes" in the arterial system.

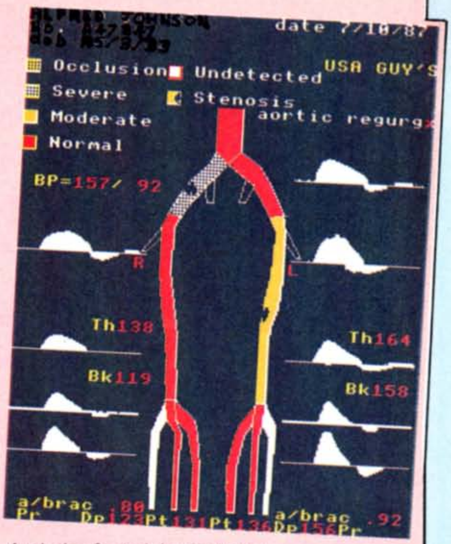
By projecting a low-power beam of ultrasound through the skin, Doppler shifted frequences reflected from moving red cells give information on blood velocity above, below and directly over the site of narrowing.

Velocity information is collated and printed out as a diagnostic map indicating the position and severity of the narrowing. To accomplish this the BBC Micro uses every input/output port available – apart from Econet – plus an extra 128k of sideways ram.

These days, arterial narrowing can be treated relatively simply by applying a combination of laser and expanding balloon dilators via a thin catheter inserted into the artery. This reduces the need for surgical replacement of arteries.

The diagnostic map supplied by the BBC Micro at Guy's Hospital pinpoints significant narrowing, which allows catheter treatment to be directed immediately to the appropriate level.

Same day diagnosis and treatment is now practical – and by eliminating the need for surgery and subsequent recovery period in hospital, this offers benefits to both patient and the Health Service.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date 7/10/87
▨ Occlusion
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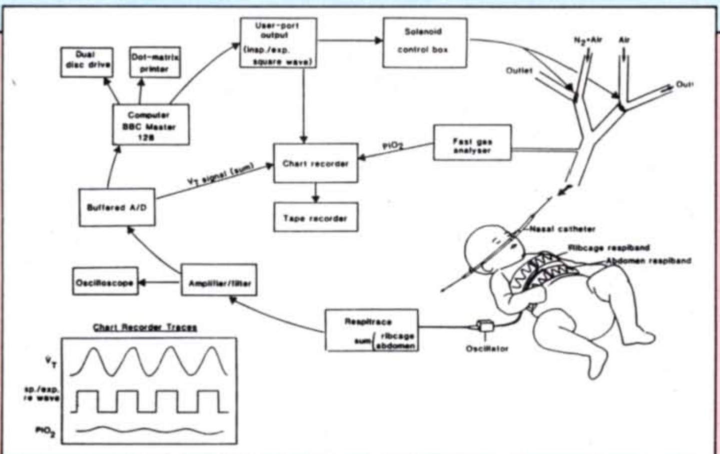
Analysis of arterial constriction


User-port output (insp./exp. square wave)
Solenoid control box
Dual disc drive
Dot-matrix printer
Computer BBC Master 128
N_2+Air
Air
Outlet
Out
Fast gas analyser
PIO_2
Chart recorder
V_T signal (sum)
Buffered A/D
Tape recorder
Nasal catheter
Ribcage respiband
Abdomen respiband
Oscilloscope
Amplifier/filter
Respitrace
sum ribcage abdomen
Oscillator
Chart Recorder Traces
V_T
sp./exp. re wave
PIO_2

Set-up used in computer testing for 'at-risk' infants

Cot death research

Each year in Britain about 1,500 babies between one week and two years old die suddenly and unexpectedly with no adequate explanation of the cause of death.

Although a rare tragedy – affecting only about three in every 1,000 births – "cot death" remains the most common cause of death in babies after the first week of life.

A belief that Sudden Infant Death Syndrome – to give it its proper name – could be reduced if there existed a means of screening babies in order to detect those who are "at risk", prompted the entry from researcher officer Prem Kumar.

Development of such a screening method using a BBC Master is the basis of his work at Reading University and the Department of Neonathology in Maastricht, Holland.

The method depends on the computing power of a Master 128 and, in particular its input/output capabilities. It involves giving a baby different gas mixtures to breathe on a breath-by-breath basis and measuring the breathing pattern. Gas delivery, using electronic solenoids, is under computer control via the user port.

Breathing movements of the sleeping baby are measured using inductance bands placed around the infant's chest and are amplified and filtered before being input to one channel of the A/D port of the Master 128.

The signal is digitised and a Basic program finds its peaks and troughs. From these the volume of air breathed and the inspiratory and expiratory times of each breath can be derived and stored on disc for subsequent analysis using a suite of Basic programs.

The input signal and timing of peaks and troughs are displayed in real time on the VDU.

Helping hand ...

Manchester orthopaedic surgeon David Marsh uses a BBC Micro for studying the function of the hand and its nerve supply after injury.

The computer is the hub of a system housed in a custom-made trolley which can be wheeled between lab and hospital. With it David can assess both motor function and sensation in the hand and record electrical signals from muscles and nerves.

Plugged into the 1MHz bus is a Unilab Interface, with four A/D convertors and eight digital lines. Devices which are interfaced through this include force transducers – used with software which allows measurement of the strength of various grips and the precision with which grip can be controlled – and neurophysiological amplifiers, used with software which converts the BBC Micro into a four-channel digital storage oscilloscope.

The user port controls a vibrometer – a device for measuring sensitivity of the fingers to vibration of various frequencies.

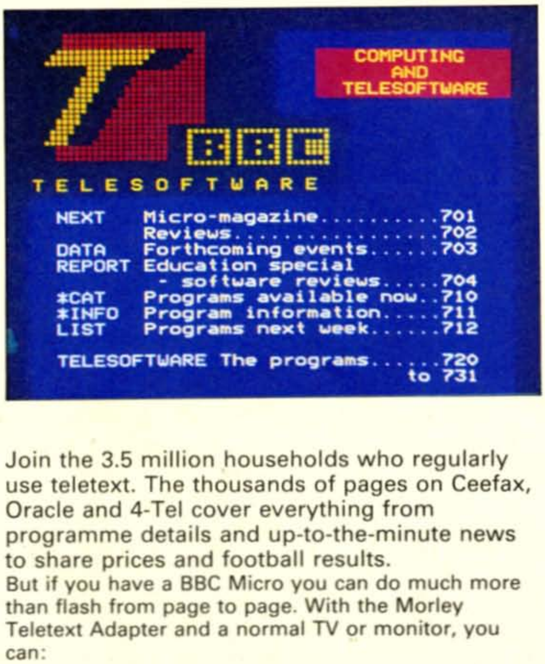
Analogue output in the form of trains of pulses (PB7) feeding into a F/V convertor controls frequency, and analogue input representing amplitude of vibration is obtained in the same way (PB6).

"This is highly appropriate since the nerves under test function in exactly the same way", says David Marsh.

***More stories of unusual entries in next month's* The Micro User.**

Turn your BBC Micro into a teletext receiver!

MORLEY ELECTRONICS
Advanced Teletext System USER GUIDE
MORLEY ELECTRONICS
TELETEXT ADAPTER



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                         COMPUTING
                            AND
                       TELESOFTWARE
               BBC
TELESOFTWARE

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          - software reviews.....704
 *CAT    Programs available now..710
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Join the 3.5 million households who regularly use teletext. The thousands of pages on Ceefax, Oracle and 4-Tel cover everything from programme details and up-to-the-minute news to share prices and football results.

But if you have a BBC Micro you can do much more than flash from page to page. With the Morley Teletext Adapter and a normal TV or monitor, you can:

- Store pages in memory
- Download the FREE telesoftware (updated every week)
- Use the real-time clock in your programs
- Automatically load associated pages each time you select a page from the menu – considerably speeding up access time

The Morley Teletext Adapter is simple to install – it plugs straight into the user port. The software is menu-driven with easy-to-follow instructions – it even automatically tunes itself to the required channel.

What you get

The stylish teletext unit, 16k ATS rom, 16k utilities rom (including printer dumps), two manuals and a utilities disc. An optional power supply is available.

NORMAL PRICE
£127

SPECIAL OFFER PRICE
£99.95

Note: If you use your BBC Micro's auxilliary power socket for your disc drive, or any other external device, you will need a power supply which we can provide for £9.95.

All prices include VAT and P&P.

IMPORTANT: The BBC points out that a teletext adapter, like a TV set, will not work satisfactorily without a good outside aerial. Nor will it function correctly if you experience reception problems such as ghosting.

They emphasise that these problems only affect a few areas of the country. However if you have any doubts as to the quality of signal available in your area you should contact the BBC Technical Support Service on 01-927 5040.

TO ORDER TURN TO THE FORM ON PAGE 165

CEEFAX Guide

Software is currently transmitted for a period of one week. The teachers' notes for the TV series Issues *are transmitted from Wednesday to the following Tuesday and all other files are updated on Fridays. There will be periods during the update day when the files are unavailable. The program details given are provisional.*

January 1 to 7

T/SWR10
Vector
Lock
Part 10 in the series explaining how to make use of sideways ram in the BBC Micro looks at how to alter vectors to point to your own routines held in main memory or sideways ram instead of the normal OS ones. A cassette file locking routine is provided as an example.

Assem
Manual1
Manual2
Printer
The latest version of the Lancaster 65C02 assembler for use from sideways ram or rom. The manual has been greatly expanded to cover the new aspects of this rom and is presented in a form suitable for downloading on to any disc format.

T/Hang
P/Hang
The BBC Micro has seen many varieties of the classic game of Hangman, but none as interesting as the version available here.

Compres
A utility from the March 1987 issue of *The Micro User* that creates multi-statement lines to save memory in your Basic programs.

January 8 to 14

T/OSB09
B/OSB09
The Osbits series describing the BBC Micro's assembler makes a welcome return after its Christmas holiday. Part nine looks closely at operating system calls – an area covered in earlier modules but discussed here in greater detail.

T/SWR11
Private
Trace
It is often necessary for sideways ram programs to use an area of user memory as workspace. T/SWR11 looks at how a rom should make a request for such an area to be allocated for its sole use – a principle demonstrated with an example program that reads the number of disc cycles on the default disc drive.

Diary
D/Text
An electronic daily diary allowing you to keep a record of past, present and future events. There are a variety of powerful routines for use with the entries, including a search for specific items.

Inlay
InlyTxt
Produce your own personal cassette inlays for all your music tapes. Enter details of the recorded music track by track, add a main title, then Inlay will print out a neat and tidy card to fit inside the cassette case. The program requires an Epson-compatible printer.

Sftwear
Knitting soft-wear from the June 1987 issue of *The Micro User*. The program allows you to design your own patterns for Raglan jumpers.

January 15 to 21

PrntBuf
BufInf
When printing large amounts of text from a program, the micro will stop and wait for the printer to catch up before continuing with the rest of the program. This delay can be avoided by using a printer buffer, most of which use sideways ram to store the data being sent to the printer. This a problem if you are using SWR for other things, or you don't actually have any, so PrntBuf allows you to create a buffer anywhere in the micro's main memory.

T/OSB10
B/OSB10
More from the Osbits series describing the BBC Micro's assembler language. This module discusses error reporting routines and how to trap errors at assembly language level.

T/SRW12
Absol
Intlace
Trace
Part 12 in the series describing sideways ram and rom on the BBC Micro looks at rom absolute work space. This area is only likely to be needed by more advanced users, but an *illegal* use of the call to claim it can result in a variety of useful effects. The demonstration program shows how to use this facility to keep the video interlace turned off.

Flip
An interesting and unique game to keep your mind active and your fingers nimble.

Catalog
An automated database to catalogue your discs. This program appeared in the May 1987 issue of *The Micro User*.

January 22 to 26

TPrint
TPrint2
Tp/Inf
A program to automatically save a series of Ceefax pages to disc ready to be reloaded and viewed at your own speed. Instant hardcopy is available at the press of a key, also a printer buffer which allows you to view the next page while one is being printed is incorporated.

T/OSB11
B/OSB11
A further look into techniques of assembly language programming. Inputting numbers into the micro involves reading the Ascii value of the characters typed then converting these into numeric data. The text file explains how the accompanying example program operates and why it uses a new routine rather than using an available OS call to input numbers.

T/SWR13
Files
Trace
More in the study of sideways rom and ram programming. Errors created in other roms can be trapped and acted upon within your own sideways ram software. T/SWR13 demonstrates how the *disc full* and *cat full* errors generated by the DFS can be trapped and used to prompt for a disc change.

Morse
Teach yourself Morse code with this easy-to-use tutorial guide to this important communications language.

LogTank
Learning can be fun with this unusual and visual game from the July 1987 issue of *The Micro User*.

January 29 to February 4

GravTxt
Pendulm
Prjctle
An educational study of the effects of gravity on objects such as a pendulum or a projectile. Their movement is simulated on-screen and their course plotted.

T/SWR14
Buffer
An interrupt can be generated by any hardware in the computer system. When this happens, and the MOS does not recognise its type, it is offered to the paged roms for action. If they also fail to recognise it, it is sent to the user via the IRQ2 vector. SWR14 explains how to deal with interrupts, and offers a 15.75k sideways ram parallel printer buffer by way of an example.

MultiS
Multi2/5
A suite of programs forming an accurate and detailed study of wheels within wheels – the path of a point on a wheel rotating inside another turning wheel.

T/OSB12
B/OSB12
Osbits continues its study of inputting numbers. Part 12 explains the process of converting from Ascii values to binary numbers.

Arena
A fast-action two-player arcade game from the October 1987 issue of *The Micro User*.

by
The
Mad
Hatter
10/6

Dogged by Philosopher's Quest

I WAS amazed by how many people bought **Philosopher's Quest** and then gave up in despair. So to start this month's column off, here's some more on the lost dogs:

The old lady was delighted with the first dog, even though it wasn't hers; so off you go again, but this time into darkest danger.

Leave the bungalow and go back to Piccadilly, where you will now see doggy footprints leading North.

Don't forget to JUMP N from the gloomy area into the danger room and then CRAWL N to the bare cell. Take the bronze trophy and type in SPOT for the dog to appear.

How on earth you are supposed to guess the wretched canine's call sign I'm blowed if I know; there's no clue in the game, so I had to look it up.

Take the dog, HOP S then RUN S to avoid the dangers, and off you go to the bungalow. I also got the bottle, filled it with ink, and left it on the beach ready for the octopus.

Once again the lady is delighted, but you still haven't got the right dog, so it is disposed of. Third time pays for all they say, and off you go again.

Back at the North end of the N-S passage, moves E and E take you to the alcove with the kennel – this time there's barking. Have faith, type GET and go to Dead Man's End, then E into the alcove where the paint will render the dog visible.

Trundle him off to mumsie who remembers you in her will and conveniently expires. Take the will to the solicitor's office, leave it there while you go and pick up the platypus, and on your return you'll find a big fat cheque. That's what I call high-speed probate.

The rest of the game is just a matter of amassing treasures from here and there and conserving your light sources.

The whale's innards are random and thus a matter of luck, so save just before leaving the wreck.

The best I could achieve for the tooth was W, W, and NW; lighting the driftwood enables the whale to burp you into the water where you must avoid death from divers' bends and being eaten by amphibious spiders. Leave the

Helpline

I have been verbally chastised by Harris Irfan for not being explicit enough with **Hobbit** help, so here are some addenda, supplied by Harris, which are the fruit of bitter experience.

Too much wearing of the ring in the goblins' dungeons entails the risk of losing Thorin, who is essential to the successful completion of the game.

In the Elvenking's halls, a living butler is vital: Get Thorin to climb into the barrel, wear the ring, wait for the butler to throw the barrel through the trapdoor and then jump on to the barrel.

I now quote Harris verbatim: "Finally having arrived at Long Lake, I followed your advice, got Thorin to open the side door, went into the mountain, took the treasure, fled via the side door and carried on till I reached Lake Town.

"Then: SAY TO BARD 'SHOOT DRAGON' and Bard says No.

"Lucky I saved the game after the dungeon". He should also have saved just before pinching the treasure, too. The second time round I did the same thing, but Bard wasted time by taking an arrow out of his quiver.

"The third time I made sure Bard had taken the arrow out by asking him before setting off for the mountain..."

As I mentioned last month, politeness is needed to obtain Bard's full cooperation.

Sean Marsh can help Tim Clapp in **Citadel**: Drop the barrel in the cellar, jump up to the left into the ceiling where there is a secret passageway leading to a hidden crown.

Thomas Skelley has **Bored of the Rings** trouble. Fire the rifle at the Nazal in the C5 – that will cure his adenoids. Tom ought to go rafting, too.

Jonathan Day can't find the petrol in **Circus**: Have the snorkel and the can, go to the generator and type Syphon Petrol.

In **Hampstead**, J.Collins needs to go to the party at Covent Garden and TAKE PIPPA – feminists love this one.

In **Price of Magik**, Ian Sharman has difficulty with the giant slug: Richard Entwistle's advice is to try a pinch of salt.

Ian Weston has sent a **Terrormolinos** solution – thanks. However, he's stuck in **Kayleth**. Nick Creggan's solution suggests he needs the cutters in the mine shaft to get the ore to put in the machine. The compost is needed to plant the bulbs in and the tunnel door needs blasting open.

Finally, Searle Siemessen gives the following **Countdown to Doom** help: The marks on the town wall give a 5x5 matrix; write in it the letters found on the SE of the dome to learn how to disable the robot. Push the fourth shape you find in the alcoves of the metal corridor to get to the underground area.

Feed the computer with the shapes in the same order they were seen, to get the rod which lets you safely out of the dome. Don't linger. Move lever, then pull gently to start the floating platform. After that it's U, SW, SE, W, N, SW and it will stop in the hold.

Elite Tips Part 2

If you took last month's advice, you should be happily trading between Vetitice and Anarlaqu in Galaxy One when you receive the congratulatory message: Right on Commander! If you are in Anarlaqu's space, land there to receive instructions.

If you have sustained damage, you may feel it worth landing at Vetitice to buy new equipment and you will receive instructions there instead.

You will be told that an experimental ship – the Constrictor – has been stolen and that a volunteer is needed to locate and destroy it. Press the spacebar to get the second half of the message.

If you have equipped yourself properly you'll have the Military Laser – essential for destroying the Constrictor – and Galactic Hyperspace. If not, get them as soon as possible.

You will be told that the Constrictor was last seen at Reesdice, a Communist rich agricultural system some 20 light years away.

A route that allows for maximum trading opportunities and minimum combat is as follows: Anarlaqu (feudal, poor agricultural), Zadies (multi-government, rich industrial), Esusti (Communist average industrial), Xezaor (multi-government, rich industrial) and on to Reesdice.

When you arrive at the station, use the data on system option (f6) and you will be told that the Constrictor purchased and used galactic hyperspace from this system. Refuel and do likewise.

Emerging in Galaxy Two, you are faced with a whole group of star systems inside your seven light year radius. The first time I did the mission, I landed at the nearest space station, refuelled and then methodically searched the area until I found a planet that had news of the fugitive. That place is Cearso, a poor agricultural anarchy system; thus, I can shield you no longer, gentle reader – you must enter the harsh world of reality and fend for yourself.

There are three ways of coping with an anarchy system: First, do not assume that all ships are hostile, only engage in combat when you must, and realise that it will take you a while to arrive at the space station.

The second method (the one I prefer), is to seek out and destroy every ship the moment it is in range: If you do this quickly enough, you'll have time to jump closer to the planet before the next attack wave comes.

The third method is to use the escape capsule when all else has failed. This method always strikes me as cheating, somehow.

The final part of the first mission, I'll leave to next time.

albatross and the M.E. maze till last of all, and don't forget to conserve your light sources at all times.

In particular, when you know the next move is into a naturally lighted area, switch the lamp off before moving and don't switch on until you are actually in the dark. Do remember, though, to count carefully when handling the cheese.

When you have all the treasures, try saying BLACH as a nice wholesome expletive and top marks should be yours.

Popularity poll

Some computer games are extremely difficult to categorise, and the new Mosaic release – **Yes Prime Minister** – is one of them. It's a cross between a management simulation and an adventure game.

It reminds me of The Secret Diary of Adrian Mole in that, depending on the answer you give to a question, you can be faced with various situations from which you need to extract yourself. It also reminded me of the Simon Hessel simulation – GB Ltd.

Yes Prime Minister runs on all versions of the BBC Micro, and it has a save game facility enabling you to finish play at the end of each day in office. It also has a timer facility so you can move through each day at a faster rate when nothing is happening.

The game opens with you safely ensconced in Number Ten; you have the country to run with the assistance of dear Bernard, while Sir Humphrey hovers like a banshee in the background. Your purpose is to survive five days in office and then get yourself re-elected: you start on April 1st – need I say more?

As you might imagine, various circumstances arise that require instant responses, and you can finish up rather like a juggler trying to keep several hot potatoes in the air at once.

For example: Your daughter has been wheel-clamped, what do you do with the policeman responsible? It's time to form a Ministry for women to placate those lovely libbers, the Taoiseache (pronounced "teacher" if you have drunk enough) needs a racing tip and so on.

By the time you have dealt with interpersonal relationships amongst parliamentarians (a punch-up to you, mate), have decided the relative merits of nuclear power stations or the green solution and have successfully fobbed off the dottier of your old acquaintances, you will have deserved re-election.

The best humour, to my mind, was found in the script for Sir Humphrey: I love bland circumlocutions which turn out to have a hornet-like sting in the tail. As a long time fan of the TV series, I loved it.

I played Yes Prime Minister quickly through twice, as soon as I received it – this takes about an hour – and managed to get myself re-elected both times.

In my vocation you need to have a deep understanding of the wellsprings of human emotion and action, as well as

Turn to Page 142 ►

Problem Corner

Simon Anderson needs help in **Mordon's Quest:** In the jungle how does he pass the carnivorous plant, and what happens in or around the hut?

I've lost my solution to **Rebel Planet**. How can Tim Moore get into the university at Yoto and pass the guard in the museum on Zoddi?

Fiona Gauhl has problems in a new one to me – **Masters of the Universe**. As He-man, she can't pass Evil-Lynn or cross the moat into Castle Greyskull because of the tentacle.

In **Mystery Funhouse**, Jonathan Day can't survive the shooting gallery – who can help?

How does J. Collins get the Baton from the hand in **Golden Baton**, and harness Pegasus in **Perseus and Andromeda?**

Arron Stoner would like to go S from the orange lobby in the mathematical adventure **L**. Bill Hensman has supplied the only major attempt at a solution but has never found the key: Can anyone help?

◀ *From Page 141*

a resolute confidence in the innate goodness of mankind. I also have had the privilege of knowing a number of politicians on a personal basis – this undoubtedly helped.

I then tried playing the game by entering common sense answers (or honest ones) and it did not take long for my popularity rating to plummet. It also produced hilarious responses in the script: Sir Humphrey had some lovely things to say to me at times.

I have played Yes Prime Minister five times now, and I believe I have explored the depths of the game – I'm not sure how many more times it could maintain interest.

Thus, if it were priced at around a tenner it would have cost me £2 a time. As it is, Mosaic are asking £14.95 for the cassette version and £19.95 for the disc. Someone has an even bigger sense of humour than me.

Hall of Fame

J. Collins for a solution to Part 1 of Dodgy Geezers: He can't play Part 2 because the Save system refuses to work for him.

Both Hac-Man and I have received dozens of Palace of Magic solutions, but in view of the competition, we're keeping mum for the time being.

Gripes and moans

A moan from Helen-Louise Windsor: Why are so many games not Master compatible? Would readers care to help compile a list of adventures/arcade adventures that can be played on a Master? Also, what games can run after using Acorn's Convert?

I think I brought some relief to Helen-Louise: I could get my Twin Kingdom Valley cassette to run on a Master.

She seems to have some toffee-nosed teachers at her new school – fancy only letting pupils play serious games in lunch hours (TKV was out) – and who decides what is serious?

Tim Moore is furious at the lack of interest Mastertronic seem to be showing in releasing the second part of Lord of the Rings for the BBC Micro – what about a monumental moan at Mastertronic from readers?

Alan Lodge of Leeds has a Master Compact and can he get any adventures? Can he heck! Is there any adventure software on 3.5in disc that readers know of?

After reading these agonised pleas, I spoke to Robert O'Leary from Robico. He tells me that all their adventures are Master compatible – though I suggest when ordering by post you specifically state the type of micro you have. He also told me that they will gladly supply adventures for the Master Compact though you must use it in DFS emulation not ADFS mode.

Write to Robico at 3, Fairland Close, Llantrisant, Mid Glamorgan CF7 8QH for details: It's nice to hear of one software house prepared to offer real service to all BBC Micro owners.

Dr B. Jones of Lichfield has a copy of Acheton that he can no longer use on his (guess what?) new Master. First letter to the office gets his address.

See you next month. Until then, happy adventuring.

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Numbers
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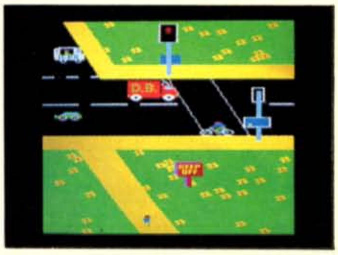
Seaside
Snap



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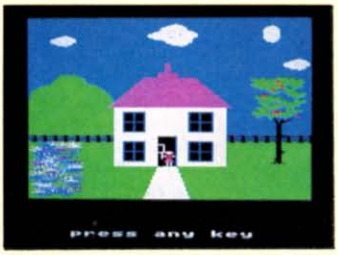
press any key

HOUSE
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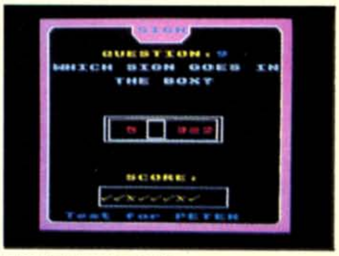
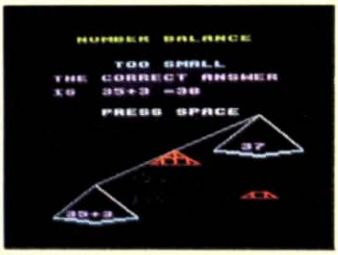
Ages 5-8

Balance
Castle
Derrick
Fred's Words
Hilo
Maths Test
Mouser
Number Signs
Seawall
Super Spell



```
SIGN
QUESTION: 9
WHICH SIGN GOES IN
THE BOX?
SCORE:
Test for PETER
```

NUMBER SIGNS
Provide the correct arithmetic sign and aim to score ten out of ten

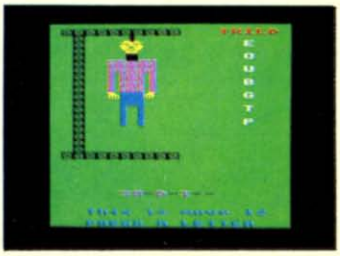


```
NUMBER BALANCE
TOO SMALL
THE CORRECT ANSWER
IS  35+3 =38
PRESS SPACE
```

BALANCE
Learn maths the fun way. Type in the answer to balance the scales

Ages 8-12

Anagram
Codebreaker
Dog Duck Corn
Guessing
Hangman
Maths Hike
Nim
Odd Man Out
Pelmanism
Towers of Hanoi



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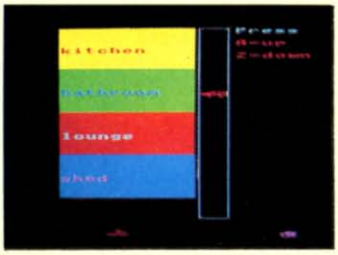
Improve your child's spelling with this fun version of the popular game


kitchen
bathroom
lounge
shed
Press
8=up
2=down

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 165

Discover the inner secrets of arcade games with . . .

I'M devoting most of this month's column to Elite's Airwolf – the helicopter game based on the television programme of the same name. The full solution and map have been compiled using information provided by Michael Yick of Sowerby Bridge, West Yorks.

Michael also has a number of tips that will be invaluable to anyone intending to complete the game. All references such as SW5 and B3 apply to the accompanying map. His hints are as follows:

The helicopter has four shields, but each bump causes an eighth of a shield to be lost – this is indicated by a low-pitched sound. A sharp high-pitched sound indicates one has been fully depleted.

You must learn to use the cursor and nudge keys without looking at them – this is vital, and takes some getting used to.

Most Airwolf enthusiasts should have discovered that holding down any cursor key causes the game to freeze – movement of the whole game is broken down into frames and the lift, aliens, balls, and boulders are also frozen until either the helicopter moves or the cursor key is released. What's more, there is no gravitational pull on the helicopter.

This advantage may be a bug or a feature deliberately incorporated into the game, but although it allows you to cheat a lot, it can backfire at the most inconvenient moments. For example, if any of the cursor keys are held down while shooting at switch SW5 or alien A2, the helicopter immediately explodes. Since these two tasks are probably the hardest, you cannot help thinking that the bug is intentional.

The Airwolf mission is divided into three rounds. In the first you must rescue one scientist from the stated sector and return to landing pad S0.

Then in the second, the aim is to pick up two scientists from two stated sectors. You can pick up any two but I recommend:

Sectors	Order
1, 2	1, 2
2, 3	3, 2
3, 4	3, 4
4, 5	5, 4

In the third round all five scientists must be rescued in any order from all five sectors and I recommend:

Sectors	Order
1, 2, 3, 4, 5	5, 3, 4, 1, 2

After you have completed all rounds the game starts again. Note that on the multiple rescue rounds you must collect all the men before returning to pad S0. Thank you, Michael, and also to A. Geer for a number of useful tips.

For anyone who still finds the game too difficult, I have written a routine – Program I – to provide infinite shields on both the cassette and disc versions. The boulders and aliens are still deadly – I haven't made it too easy – but you are invulnerable to everything else.

To end this month's column on a high note, Michael's own best score on Airwolf is 75623. Without infinite shields or any other modifications, can anyone do better?

Airwolf – the complete solution

SECTOR ONE

R1: Shoot deflector DF1 at the position marked X, to open door D1.
R2: Go through door D1.
R3: Continue left, avoiding boulders B1 and B2.
R4: Follow the third boulder (B3) down the passage and pick up the scientist at pad S1.
R5: Continue left and shoot wall W1 until the hole is large enough for the helicopter to pass through.
R6: Wait for the lift to come down, follow it back up the passage and dodge in through door D2.
R7: When the lift has gone back down, move up to wall W2.
R8: Destroy both W2 and W3 taking care to avoid the two aliens.
R9: Continue right, avoiding the three boulders (B3, B2 and B1).
R10: Go back through the door D1 and land on pad S0.

SECTOR TWO

Carry out R1, R2 and R3.
R11: Follow boulder B3 down.
Carry out R5 and R6.
R12: Move left and shoot the button B1, then shoot the deflector below (DF2). Move right and pick up the scientist at S2 in the water tank (WT).
Carry out R7, R8, R9 and R10 to return to the launch pad.

SECTOR THREE

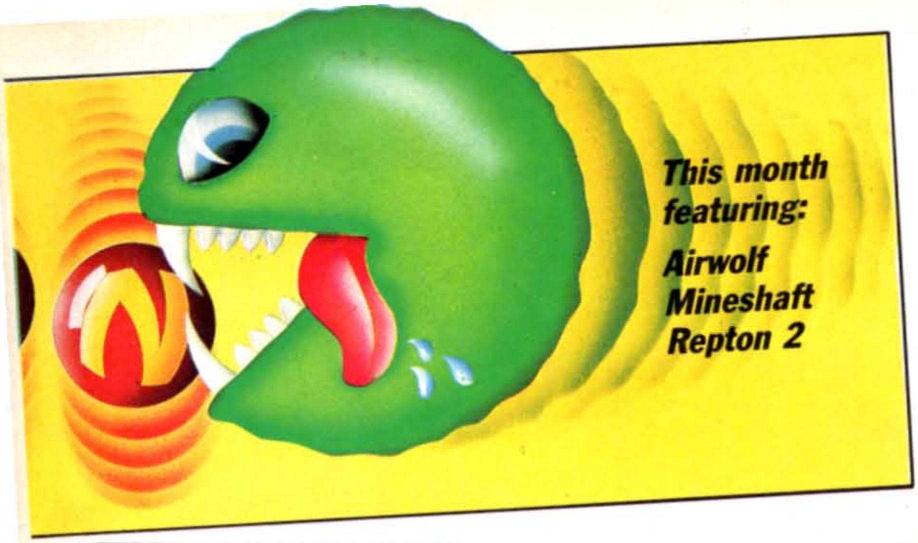
Carry out R1 and R2.
R13: Follow the boulder B1 down the passage.
R14: Shoot switch SW1 to release the chain.
R15: Move down and shoot wall W4. There are two alternative methods that can be used to rescue scientist S3.

METHOD ONE

This appears to be the intended method, as devised by the author of the game. Although it is not as complicated as the second method, the risks are higher.
R16: Move past alien A1 guarding switch SW2.
R17: Shoot all the electrified walls (EF) on the left. Each wall must be shot about 15 times.
R18: Wait in the space SP1 until alien A1 comes and smashes into door D3.
R19: Move right and shoot switch SW2 to open door D3.
R20: Go through door D3 and rescue the scientist S3.
R21: Go back through door D3 and fly back to wall W4.
R22: Move left towards wall W5.
R23: Destroy wall W5.
Carry out R6, R7, R8, R9 and R10.

METHOD TWO

This is a more devious method and involves the use of the cursor up key. Although it is more tricky to execute, the risk is eliminated.



This month featuring:
Airwolf
Mineshaft
Repton 2

Program I: Airwolf infinite shields

```
 10 REM Airwolf Cheat
 20 REM by Hac-Man 1987
 30 REM (C) The Micro User
 40 oscli=&FFF7:FOR I%=0 TO 2 STEP2
 50 P%=&900:[OPT I%:LDX=D%MOD256
 60  LDY=D%DIV256:JSR oscli
 70  LDX=C%MOD256:STX &1B4D
 80  LDX=C%DIV256:STX &1B4E:JMP &1960
 90 .C%LDX=&A9:STX&5C64:STX&5FEB:LDX=1
100  STX&5C65:STX&5FEC:DEX:STX&5C5E
110  JMP&7900:.D%OPT FNs("LOAD WOLF2")
120 ]:NEXT:CALL &900:END
130 DEFFNs($&700):$P%=$&700
140 P%=P%+LEN$P%+1:=I%
```

R24: Make sure the helicopter is in position P1 (see the map on the following pages) and facing towards the right.

R25: Hold down the cursor up key.

R26: Still holding the cursor up key, gently move the helicopter downwards one step at a time until it is parallel to switch SW2.

R27: At some stage the alien should be absent from its position: if so then shoot switch SW2. However, if the alien is present repeat steps R24, R26 and R27.

R28: By using the nudge keys (A/S) move the helicopter away from the switch towards the electrified walls (EF).

Carry out R17, R20, R21, R22, R23, R6, R7, R8, R9 and R10.

SECTOR FOUR

Carry out R1, R2, R13 and R14.

R29: Fly left towards wall W6.

R30: Destroy this wall and shoot switch SW3.

R31: Repeat the above procedure for wall W7 and switch SW4. Alien A2 will now move downwards towards the bottom switch that looks like a detonator. If the alien reaches it the helicopter will explode, so it is vital that you shoot the alien before it gets there.

R32: Place helicopter in position P2, facing right. Note that the helicopter

Turn to Page 146 ▶

Repton Revisited

Superior's great new Life of Repton has been taking up a lot of my time recently. Our little green friend has probably received more than his fair share of attention since this column began, but I find it rather surprising that I have never received a single letter with hints or pokes for the gigantic **Repton 2**.

Is it too big to solve? Is it too difficult to find any pokes for the game? Edward Meadowcroft of Horton, Northants would certainly appreciate some help: Can anyone oblige?

Conversion Corner

*When loaded into a Master, Durell's platform game **Mineshaft** suffers from two problems. First, the defined characters are displayed incorrectly. You can cure this by using the Convert program supplied on the Welcome disc.*

The second problem, however, is rather more serious: Your air supply decreases at a most alarming rate, requiring you to complete the screen in about twenty seconds flat. Luckily, you can cure this just as easily.

Ensure that Convert is running, then type:

```
!&C000=0:!&C004=0
```

followed by:

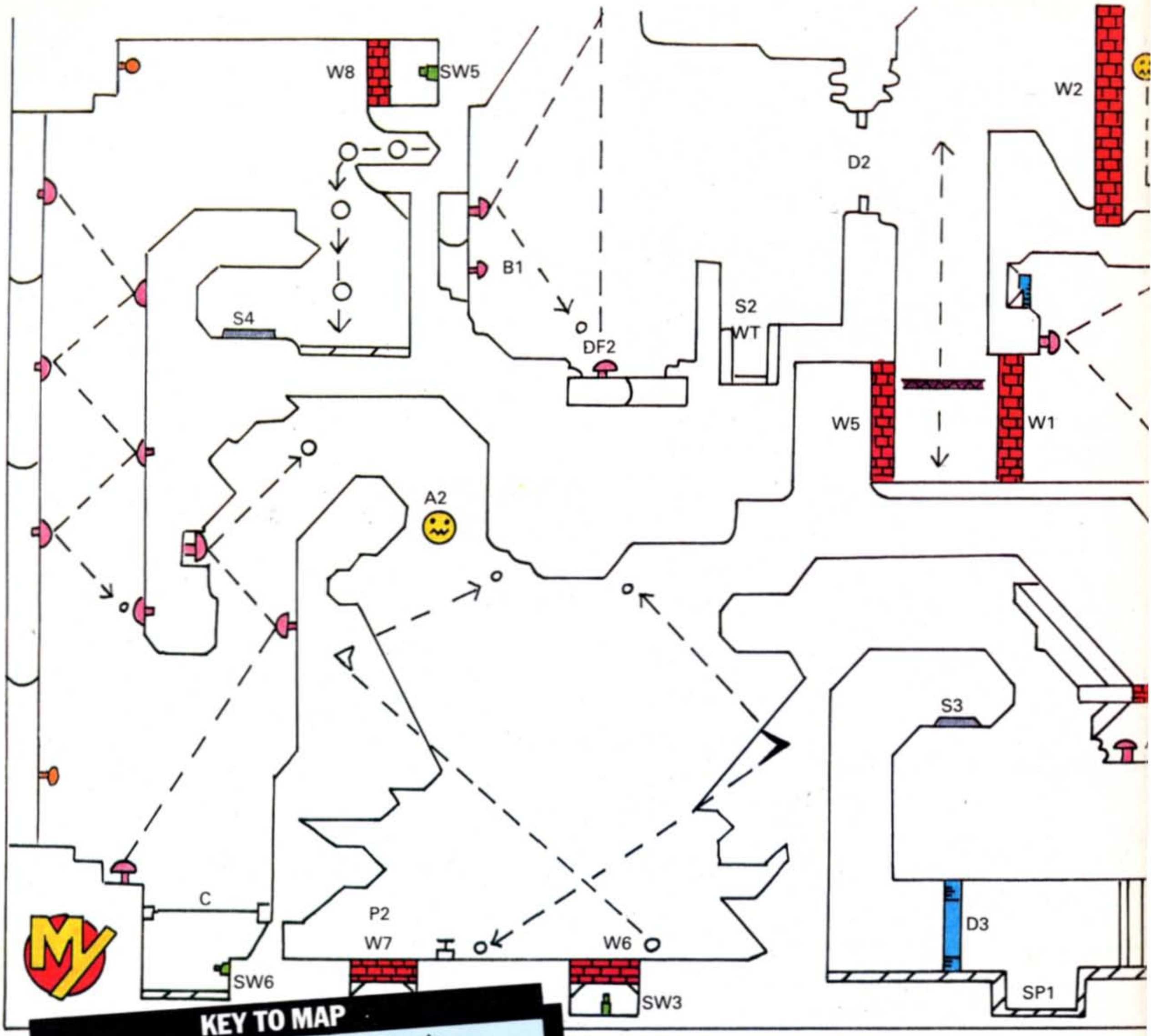
```
*TAPE
*RUN
```

as normal.

The cause of the problem is as follows: Mineshaft determines the rate of air loss by reading from the system clock at regular intervals, using osword 1. Every so often it will write zero into the clock, thereby resetting it and slowing the rate of air loss. Here too the game uses the legal method – osword 2. However, the X and Y parameters used when calling osword are merely pointers to a further set of parameters – five in the case of oswords 1 and 2 – located somewhere in memory.

In all BBC Micros before the Master, the default definitions of Ascii characters 32 to 126 were located in the operating system rom, starting at location &C000. Because character 32 is a space, the eight bytes that define it are all zeros. Therefore, on a BBC B or B+, writing the five bytes at &C000 to &C004 into the system clock will reset it to zero.

Mineshaft does this, but on a Master &C000 onwards is ram used by the filing systems – specifically the title of a DFS disc or the free space map of an ADFS disc. Either way, those vital first five bytes are unlikely to be zeros, so the system clock will be continually reset to a higher initial value. This in turn will call the routine that deals with decrementing the current value of the air supply much more often, dramatically shortening the player's life.



KEY TO MAP

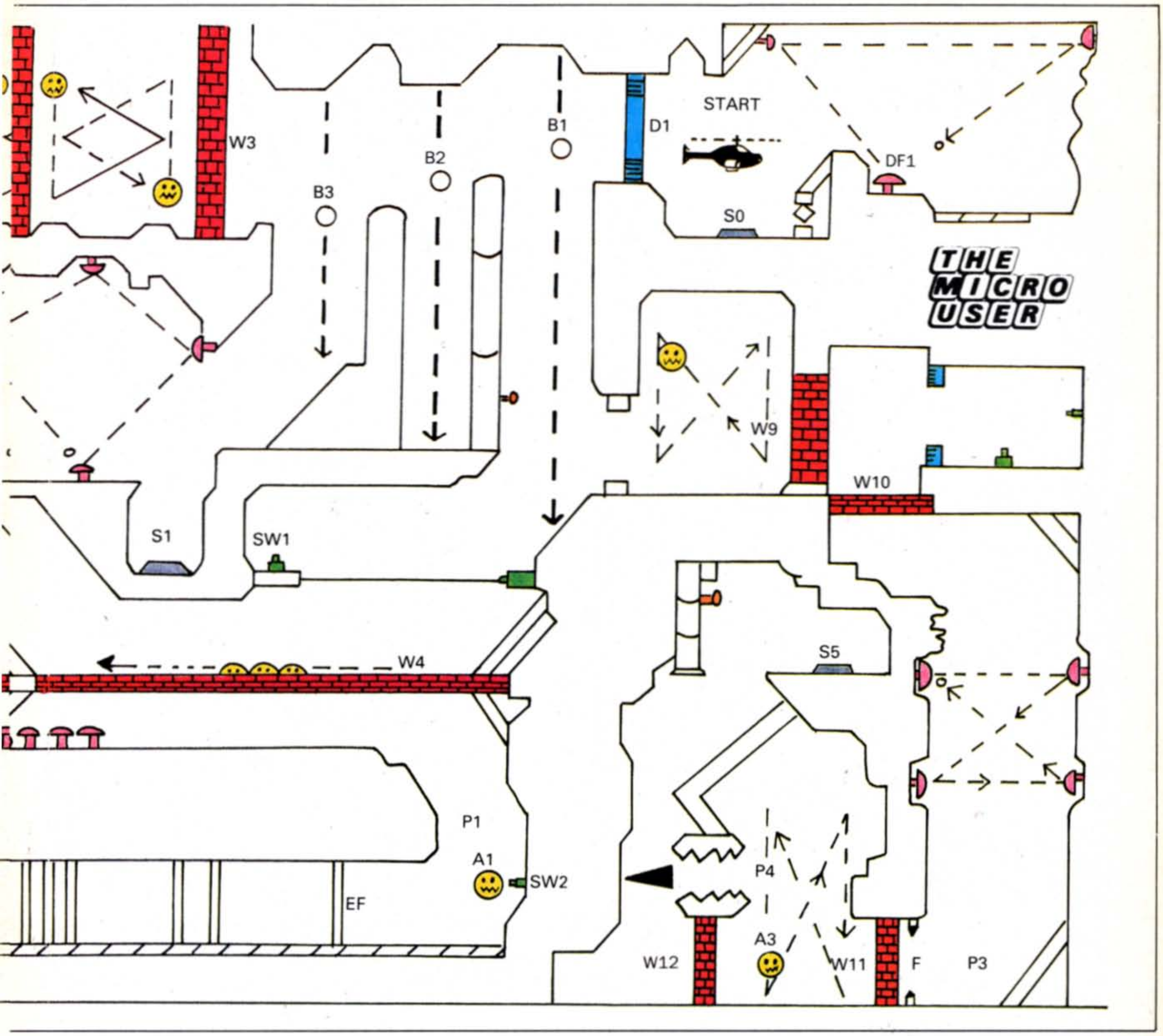
Subject	Key	Comments
Scientist	S0–S5	Object of game to collect these.
Door	D1–D2	Do not touch. Shoot the appropriate switch to open them.
Wall	W1–W12	Shoot to remove them.
Chain	C	Avoid them. Shoot the appropriate switch to release them.
Alien	A1–A3	Avoid them. Alien A2 can be killed.
Boulders	B1–B3	Avoid them, they are deadly.
Electric Wall	EF	Shoot these 15 times to remove them.
Water Tank	WT	Shoot button B1 to fill tank.
Button	B1	Shoot them for bonus points.
Switch	SW1–SW6	Shoot them to open doors and release chain.
Space	SP1	Wait here to avoid Alien.
Position	P1–P4	Wait in this position for next move.
Deflector	DF1–DF2	Some can be shot to stop bouncing balls. Hit the appropriate position marked with an arrow.

◄ ***From Page 145***

can be anywhere to shoot the alien, but position P2 is best because it is out of range of the moving balls.
R33: Shoot alien A2.
R34: Move up to the passage formerly guarded by alien A2 and fly up to wall W8.
R35: Shoot through the wall at the switch. (Warning: Do not hold down any cursor key). This releases the chain (C), allowing access to switch SW6.
R36: Shoot SW6 to halt the waterfall of boulders.
R37: Pick up the scientist at pad S4. Carry out R23, R6, R8, R9 and R10.

SECTOR FIVE

Carry out R1 and R2.
R38: Follow boulder B1 down the


START
D1
B1
B2
B3
W3
DF1
S0
THE MICRO USER
W9
W10
S1
SW1
W4
S5
P1
A1
SW2
EF
P4
A3
W12
W11
F
P3

passage and enter the right hand side towards wall W9.

R39: Shoot wall W9 and enter the next chamber.

R40: Shoot wall W10.

R41: Move down towards wall W11. Shoot through both walls W11 and W12 from position P3.

R42: Carefully avoiding the electric fence (F) and the alien A3, move to position P4 facing left, towards the spike.

R43: Shoot at the spike which will eventually be hammered into the wall, clearing the passage to the scientist at pad S5.

R44: When this is complete, move through wall W12 and rescue the scientist at S5.

R45: Go back to wall W9.

Carry out R14, R22, R23, R6, R7, R8, R9 and R10.

AIRWOLF

the Map

by MICHAEL C-Y YICK

- Alien
- Wall
- Deflector
- Switch
- Button
- Pad
- Lift
- Spike
- Closed Door

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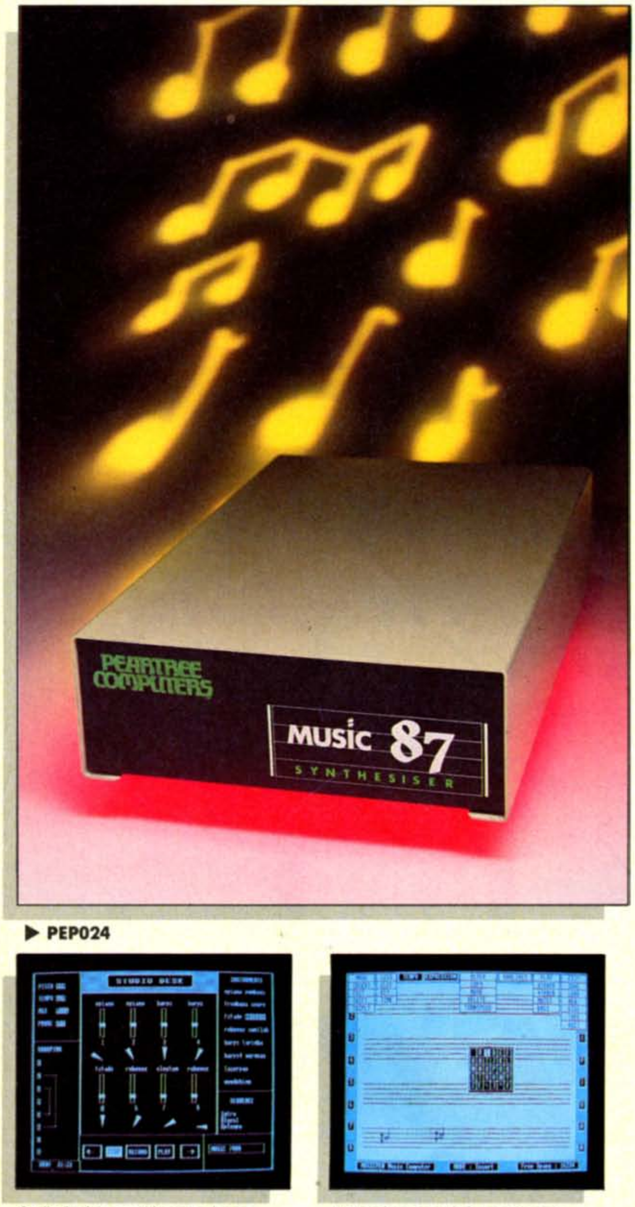
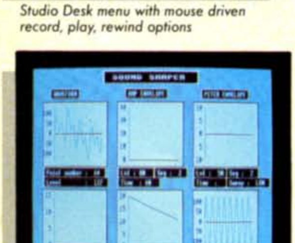
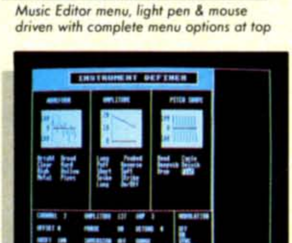


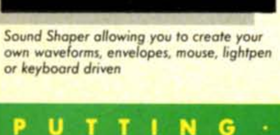
▶ **PEP024**



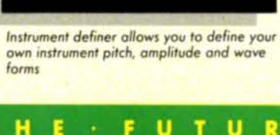
Studio Desk menu with mouse driven record, play, rewind options



Music Editor menu, light pen & mouse driven with complete menu options at top



Sound Shaper allowing you to create your own waveforms, envelopes, mouse, lightpen or keyboard driven



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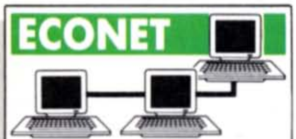

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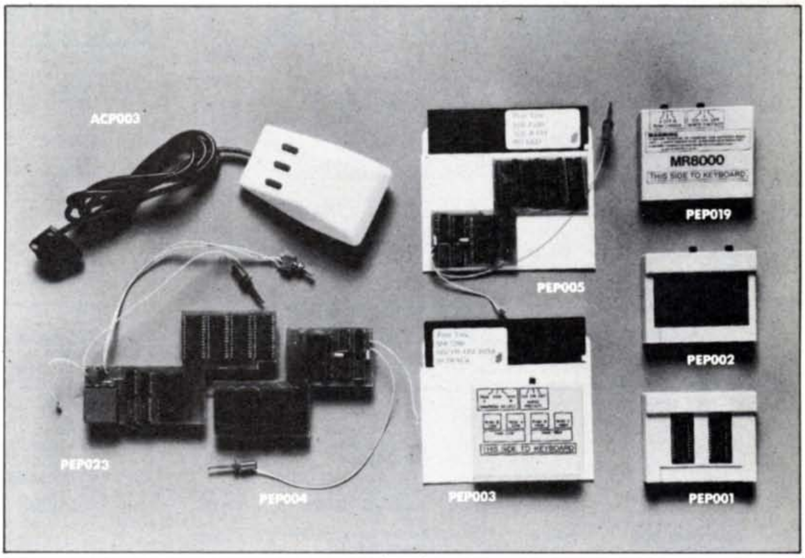

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ADVENTURE PROGRAMMING
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Birth of an idea

Pete Gerrard concludes his series on writing adventures in Basic

ONE of the best sources of inspiration for the would-be adventure writer has got to be the printed word.

Just think of some of the popular adventures of the past that have been adapted from books. The Hobbit immediately springs to mind, the slightly less successful parts of The Lord of the Rings that have appeared, and The Colour of Magic was another fairly well received one.

All in all dozens and dozens of top-selling adventure games must have had their origins in books. Even if they're not adapted specifically from any one book, games about Sherlock Holmes, Frankenstein and Dracula all owe their existence to a spot of writing from long ago.

So with this rich mine of information awaiting, how would you go about converting a book into an adventure. To take a specific but fake example, suppose you'd just finished reading The Price of Eggs by Dimli Gloing, published by TrollSlayer Press, and wanted to turn it into an adventure game. Where do you start?

The first step is where a great many ideas fail straight away: Get in touch with the author or the publisher and for this you'll have to find out who holds copyright on the book. Generally speaking, anything written by someone who's been dead for more than 50 years is going to be out of copyright and languishing firmly in the public domain – but it's as well to find out first.

In many instances you'll find that copyright has passed on via the author's estate, or someone else may have picked up on it, and any attempt to publish a game that infringes upon that copyright will land you in very severe trouble. This can happen whether you sell 1,000 copies or just hand a couple out to friends – the same strict rules apply.

To begin, you must write to the publishers – don't bother with the author at this stage: For one thing he or she might be dead and anyway, might have sold all copyright to the publishers when the book was released. So in our case a letter to TrollSlayer Press is the place to start and from here several things can happen:

- They have only published the British version of an American book, in which case you're in for a long correspondence with the original publishers. This can also happen if it's a paperback edition of a book originally published in hard back, as quite often two different companies take charge of the same book. When you eventually reach the first publisher, you can go on to the next stage.
- Alternatively the publisher will tell you that you'll have to get in touch with the author, so he would pass on your letter to Dimli Gloing. I would take a dim view of any publishing house that released the home address of an author and you'll just have to be prepared for a wait. In either case we reach the next stage.
- The book is out of copyright, so go ahead and write your game without infringing anything and, more importantly from your point of view, without having to pay any royalties to anyone – the ideal situation.
- However, they might say it's okay, but they want a royalty or some money up front, which means your bank manager determines whether or not you can write the game. If this happens you'd be well advised to give up on the idea and find something else to write about.
- No, it is not okay, it is completely out of the question, and don't even think about it. This quite possibly means that the publishers are doing it themselves or, having received your idea, think it a wonderful one but want a massive software house to do it instead. Oh well, nice try, but back to the library.
- If you actually survive all these traumas and receive permission to write the game – whether you're paying a royalty or not, and again I'd strongly advise you not to take on a game that requires you to pay money to someone else – then what do you do?

If you thought all that was tricky and that writing the game will be a doddle, well, think again. Getting permission was the easy part.

By the way, one very important source of inspiration for adventure writers is the Bible. Since getting permission from the author would obviously be a little bit tricky, I think we can safely say that you can freely use any part of it as the idea for a game. But don't be blasphemous: That's not because I'm greatly religious, it's just that an awful lot of people will not think it particularly funny, and there's no point harming sales before you start.

The plot was obviously the thing that made you think The Price of Eggs would make a great game, so you're duty bound to stick to it.

If you don't, many readers and admirers of the same book will be most upset by your game, and once again you're losing sales before you start. This is where a bit of school training actually comes into play.

A great way to start adapting any book is by writing a three hundred word precis of the plot. Now I know that doesn't sound like many words, but you can sum up the plot of most books in a single sentence, so you're giving yourself something to go on by expanding slightly. You also cut out a great deal of the blather that, however interesting, well written, or whatever, is not essential to the main plot.

Next, and here you'd be well off buying a second copy of it, you go through the book and underline, or otherwise mark, those parts of it that you think are relevant to the main story. Be ruthless: Anything that isn't essential can be ignored. Even by doing this you'll probably end up having to squeeze thirty thousand words of text into as many

Turn to Page 152 ▶

◄ *From Page 151*

bytes of computer, and this is not easy. Never mind, there's more pruning to do yet.

The core of any adventure is obviously the map, without which we would be totally lost. Guess what you ought to do next? However the story is written, there are bound to be locations in it, and ignoring the golden rule of map drawing – wherever you start on your sheet of paper will always be the wrong point – you're going to have to trundle through the book picking out the scenes where the action takes place.

You might end up with just 30 locations with two or three things happening in each, or 100 or more with just one thing happening in some of them. Write down each location – just one or two words will do for now – on a separate sheet of A4 paper. You'll see why later.

Back to the book, and back to the individual sheets of paper, and write down on them those parts that describe the location. Don't get too carried away with the author's own prose – you're probably going to have to cut it down anyway, but try not to turn the sentence:

```
'An open glade by a small stream,
cascading over the rocks as it pushes a
way through the forest'
```

into:

```
'You're in a bit of forest next to some
water'
```

From those locations, and from a combination of precis and marked passages in the book, will inevitably come the problems that the player must deal with. Write them down below the descriptions on the sheets of paper, clearly wording what the player must do in order to get through the problem set.

Here you come to a dilemma: Do you stick exactly to the book, in which case anyone reading it can automatically solve the adventure, or do you divert from it in some places and stick in some problems and locations of your own?

I think the latter has always got to be the answer – the problem with the babel fish in The Hitch-hikers Guide to the Galaxy must be a classic example of this sort of thing – because it helps to make the game interesting both to people who've read the book and those who haven't. How to divert is clearly up to you, but don't do anything that's too out of character: You'll only upset people and get accused of ruining the book.

From the sheets of paper you should now have – with room descriptions and problems written out – it's a fairly straighforward task to come up with the game's vocabulary, deciding which objects are going to be stored where, and actually getting round to the most important job of all: Writing the game.

Using the techniques described here as opposed to anything else has one great advantage. It allows two people to work together on one adventure, with the more literary one tackling the initial work and the programmer taking the sheets of paper and the map to produce the finished game.

Some books are obvious contenders for adventure writing, others aren't. But anyone who has ever played the game will soon be able to tell into which category a particular book falls. Now, after popping this in the post, I'm going to relax and read the latest Dimli Gloing classic. I wonder . . .

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All the Vu-Fax fit to print

Ian Waugh puts Morley's Teletext software through its paces

VU-FAX is a teletext system. It lets you create, edit and display up to 1000 Mode 7 screens in a variety of ways. That's interesting enough in itself, but the pages in Vu-Fax can be cycled through at the rate of around 20 pages a second.

Such speed and capacity is only possible if the system uses ram, and as we're talking about an ordinary BBC (B, B+ or Master) and not Archimedes, how is it done? Simple – with Morley's ram disc.

It's available in 1Mb and 2Mb versions (costing £199.95 and £349.95 respectively) and only works with the DFS at the moment although an ADFS-compatible version is under development. It can store 2688 files in up to 256 subdrives.

The ram disc can be configured as any drive from 0 to 9 and a utility rom works as a wedge into the DFS to redirect the necessary commands.

Operation is simplicity itself and it's transparent in use – apart from an almost magical increase in speed. For example, a 20k Mode 1 screen loads in around 0.2 seconds as opposed to the 3 to 4 seconds it would take from a floppy disc.

Vu-Fax uses the ram disc as a storage medium. At the moment the 1000 screen limit, although filling a 1Mb ram disc, is due to the three-digit limitation of teletext page numbers. Work is underway to enable the 2Mb ram disc to access another 1000 pages.

Let's run through the options. The main menu is called the System Manager's Menu and from here you can arrange and edit the pages.

First you will initialise the ram disc and load the demo pages supplied. Loading and saving pages to and from the ram disc is performed intelligently, so blank pages don't waste loading time or disc space. Your system configuration is saved too, to minimise future loading operations.

Accessing pages

The Access Pages option lets you flick through all 1000 pages. A status line at the bottom of each shows the page number, the backward and forward links and the delay setting.

The pages can be displayed in three ways:

- As a carousel – a series of linked pages which cycle automatically with no user intervention.
- As an interactive system requiring the entry of only a single-digit number to select a page.
- As a teletext emulator like Ceefax and Oracle where you can select pages by entering a three-digit number. In fact, all displays can be user interactive.

These configurations are produced by setting the forward links to determine which page follows another. The delay time determines how long a page is held on screen and the backward link allows you to move back a page.

A page may be marked as private by the System Manager, in which case it cannot be selected by the user. You can also give the system a six-letter Ceefax-style title. The default is Vu-Fax.

Pages are created and edited with Design 7 Plus (soon to be reviewed in *The Micro User*). The Vu-Fax version does have a Help page, otherwise it is virtually identical to the non-Vu-Fax version.

Lots of editing aids help you set up and organise your pages. For example, the Search facility will scan all 999 pages in less than 60 seconds for an item of up to 32 characters in length. There's a volume control, copy and wipe page options, access to star commands and five block operations: Copy pages, wipe pages, set delays, backward links and forward links.

In addition to the backward and forward links, each page may also have up to 10 option links. These allow you to move to any one of 10 pages with a single keypress. You can still access pages with three-digit numbers by preceding them with a star.

A second use for option links is to produce special effects. These are created with reserved option link and delay code numbers and the results are very impressive indeed. For example, you can scroll the page in from the left, bottom, right or top, pause for a predetermined time, then scroll out.

You can overwrite a screen from any of the four directions, and you can slide a page in from any direction.

There is a facility in which the page lines or columns zoom in leaving a trail of duplicate lines behind them. With the zap effect, characters flow in from the left-hand side and fly around towards the right of the screen until the page is constructed.

There are slow print routines, and you can mix various effects so some lines are slow printed and some scroll. You can build up and clear a page one quarter at a time, you can cause a sequence of pages to loop a number of times and you can implement a kind of GOSUB and RETURN routine.

You can also interface with a Morley teletext adapter using their ATS rom but I can see no reason why it shouldn't work with any ATS. This way you can capture pages to incorporate in your own display – but be careful not to infringe copyright.

Back at the System Manager's Menu, the Page/Link Data routines will list the pages and link routes. You can get a print out of this information, too.

Running Vu-Fax

Finally, option three lets you run Vu-Fax. This is what the end user will see. Break, Control+Break and Shift+Break have been disabled and the only way to stop the system is to switch off – unless, that is, you have the password which allows you back to the System Manager's Menu.

Blank pages and those marked private will not be displayed. You can move on to another page before the current one has been fully displayed simply by entering a new page number. H toggles Hold on and off and R keys the Reveal facility.

M will display the main menu page – usually page 100. The cursor keys are used to step forwards and backwards through the links and a new page can be

Turn to Page 154 ►

◀ *From Page 153*

selected at any time by prefixing the number with a star.

Although the demo data only contains 80 pages they do an excellent job of showing what Vu-Fax is capable of.

As for applications, imagine a user-interactive information system in a library, a doctor's surgery, a hospital, a travel agents, a shop, a bank, a school, college or university. You could call up 999 pages of information, all with single key presses. There would be none of the frustrating delays experienced with the TV teletext systems as you wait for pages to cycle and sub-pages to appear.

Alternatively, the system could be set up to give a continuous display of information with carousels. Even these can be made user-interactive as you can exit one closed loop and jump into another.

Or what about a Mode 7 adventure game? Easy with the options links. Or a quiz or questionnaire or a teaching program with multiple-choice questions? Or a school magazine?

Vu-Fax records the number of times each page is accessed and you can save this data to disc. A one-byte per page counter is used so its range is only 0 to 255. It's arranged in a simple format although you have to write your own software to interpret the data. This could be extremely useful to determine which information is most sought after, for example.

A remote keypad may be connected to the user port, and Morley will supply interfacing details on request. This would be ideal for a system designed for use by the public, or one in which you wanted to keep the computer safe or just out of sight.

For programmers, routines are supplied to let you zap pages on to the screen from your own Basic programs. The system is incredibly easy to use and set up, although you may need to spend a little time with the link options and special screen effects to get the best out of them.

The Vu-Fax software was written by M/B Software who have produced many products in collaboration with Morley Electronics. The software is available separately for £49.00 if you already have a Morley ram disc.

If Vu-Fax has got your mouth watering but you can't afford a ram disc, take a look at M/B Software's Desfax and Masterfax. Desfax (£19.95) stores pages on disc (96 on a 40 track disc) with 16 in memory at one time for carousels.

Masterfax (£29.95) was designed especially for Master computers and stores pages in sideways ram. A standard Master will hold 84 pages, and this can be increased to 148 by plugging in eprom cartridges containing ram.

The teletext system is a great way to impart information, and many people are familiar with the screen display and format. Not so with a green screen monitor or an 80-column display – that automatically spells computer.

Vu-Fax is very impressive indeed and it is already being used by several education authorities, in the waiting room of a large health centre and by a turf accountant.

What else is there to say? An excellent product. Well done Morley and M/B.

Product: Vu-Fax
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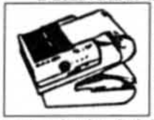

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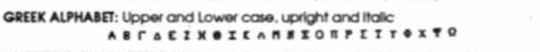

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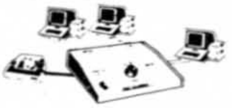

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LETTERS

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Superbly short and sweet

I RECENTLY thought up an extremely easy, fast and elegant method for shortening Basic programs. The idea is so simple I was stunned. I've tried all sorts of things to defeat it, but it works every time.

The routine itself consists of only one line. Below is an example of how to use it:

```
    0 goto 100
   10 REM Start of main pro
gram
   90 REM End of main progr
am
  100 REM First line to be
deleted
  990 REM End of deleted se
ction
 1000 !(PAGE+4)=&F4:RESTORE
 100:I%=2+!&1C AND &FFFF:RE
PEAT:I%=I%-1:UNTIL I%?-1=&0
D:?I%=&FF:!&12=I%+1:RUN
```

Line 0 jumps to the start of the area that will be deleted. This is where you should set up all your sound envelopes, character definitions and assembly code. The end of this section, in fact the end of the program, should be entered exactly as in line 1000 above except you should RESTORE to the first line to be deleted.

The first thing it does is turn line 0 into a REM statement. This prevents an attempt to call the routine a second time, and so the calling line must be the first line of a program.

The RESTORE command, followed by the REPEAT... UNTIL loop set the Basic data pointer to the carriage return at the start of line 100.

Then the memory addressed by the data pointer is set to &FF as &0D followed by &FF is used by Basic to mark the end of a program.

Finally TOP is adjusted and the shortened program is run. This automatically resets LOMEM and clears all variables.

The only way I have known this routine to fail is when it is run using BAS128 on the Master – all other configurations seem fine. – **Terry Blunt, Crowthorne, Berks.**

● What a brilliant idea. It just goes to show that the simplest routines are often the best. You can see this routine working in combination with a relocation routine in the game in this issue.

Generating crosswords

AS a very keen Australian BBC Master user for ages, I have been looking for a program to generate crosswords.

I have your word puzzle program from the December 1985 issue of The Micro User, *but wonder if you have ever published a crossword program, or know of one which is commercially available.* – **Patricia Perris, Rockingham Beach, Western Australia.**

● We know of one such program for the BBC B and Master series. For details write to Able-Soft, Freepost, Tunbridge Wells, Kent.

Tracking down typing errors

I'M writing to tell you how I managed to correct some typing errors I introduced into one of your listings.

When I checked Steve Turnbull's program Microworks using the Checksum utility I was very discouraged to note more than 20 lines with variations.

I began to wonder if there was a common link in the offending lines. So I deleted the lines which were correct and sure enough I spotted that although it would work, I had made a common difference – DEFPROC instead of DEF PROC.

Correcting this reduced the number of erring lines to eight. Then I checked for any spaces I'd inserted or left out. Finding a few, the eight lines were reduced to three.

Finally I noticed a full stop in place of a comma in the middle of some machine code and correcting this produced a working program.

I am a relative newcomer to the micro world and therefore appreciate hints and tips on correcting typing errors. The times you go over the business of checking and rechecking, only to keep missing the same mistake.

As well as the Checksum utility I have found the Basic analyser from the October 1985 issue very useful too.

I hope these tips will help other readers. – **N. A. Griffiths, Churchdown, Gloucester.**

● Many thanks for the tips. The checksums certainly seem to be helping correct those easy-to-miss typing errors.

Television debut

DID anyone else see the episode of Neighbours screened on Tuesday October 27 1987 when The Micro User *made its television debut?*

There on Madge's coffee table was a copy of the September 1985 issue – these Australians have class, even if they are a bit behind.

I would be grateful if you could tell me whether a program such as the following could damage my computer:

```
10 *MOTOR 1
20 *MOTOR 0
30 GOTO 10
```

– **Peter Wood, Chryston, Glasgow.**

● Continually switching the cassette motor relay on and off using *MOTOR will, perhaps sooner rather than later, wear the relay out.

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● Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 5NP.

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Classy cover

IT is not often that I have the opportunity to praise some of the unsung workers behind a magazine. In my opinion it is not only the articles that make it popular, but the general layout and appeal of the front cover.

I would like to praise the design of the front cover for the October 1987 issue. It is quite brilliant, and about the best original idea I have seen.

I do hope the disc was not too heavy for the person under the computer. – **Tony Lawrence, Wigston, Leics.**

● We're flattered. As for the mechanic, we have been reliably informed that he suffered nothing worse than a slipped disc.

Additional interest

I WOULD like to congratulate you for publishing David Wilson's Computing in Action article in the October issue of The Micro User.

It looked interesting so I typed it in and used it to check my own bank loan. I found, to my surprise, that I seemed to be paying about 6 per cent over the odds.

A visit to the bank proved that a mistake had been made over some time. The

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LETTERS

◀ From Page 159

corrected balance will not only pay for the magazine subscription, but the whole computer set-up as well.

Could you please explain why your monthly discs are protected? It is virtually impossible to alter anything when advised to by yourselves. – **John Cleverly, Basingstoke, Hampshire.**

● The monthly discs are no longer protected so you can easily change the listings to suit yourself.

The discs used to be formatted to prevent backup and, although they couldn't be catalogued, the filenames were usually the same as the menu names so you could load them individually.

On the odd occasions the names were different they could be easily found by pressing Break while the menu was on the screen and listing the program after typing OLD.

Opus Challenger solution

WITH regard to Mr Garner's letter in the July 1987 issue of The Micro User, *I have found a solution to his problem concerning the Opus Challenger 3.*

I have bought Citadel, Ravenskull and Grand Prix Construction Set, all of which gave me the error Bad Track Format *on booting up.*

The simple solution is to enter:

```
*OPT 8,0
```

before booting. I hope no one is discouraged from buying this great disc drive by a hitch which is easily cured. – **Richard Collins, Guilden Sutton, Chester.**

Spreadsheet quest

AS secretary of a local sports league I keep a weekly list of all match results, and maintain a league table in a similar manner to the Football Association with its weekly results and league tables. This seems to me a most suitable application for a computer.

Initially I organised a spreadsheet into which I posted match results and, on replication, everything rippled through most satisfactorily.

However, although the matches won, drawn, lost and the points scored are recorded quite correctly, the teams are not in correct league order. Have you or any of your readers knowledge of any software that would suit my needs?

For example, is there a spreadsheet with a sort function included that I could use to maintain league tables with several divisions and teams in each division in correct descending order?

I have a BBC B with Acorn DFS plus disc drive and printer. – **Mr. R. E. Hyde, Formby, Liverpool.**

● You may be in luck – View Professional, the new word processor/spreadsheet, contains a numeric and alphabetic sort function for columns. A review is planned for a future issue where all the details will be revealed.

Shadow boxing

I WAS interested to read about J. M. Fielder's problem concerning the loading of screen dumps to shadow ram (Letters, December issue), as I had a similar problem a few months ago.

Since we have a BBC Master I was able to overcome it by selecting the wanted screen mode, and then setting the shadow ram select bit in the access control register (ACCCON) to 1 with ?&FE34=15.

*This temporarily switches the shadow ram into the memory map, allowing the usual *LOAD command to work.*

To return to normal you must page out the shadow ram with ?&FE34=11 *as soon as the screen is loaded, or you will corrupt any resident program if it intrudes into the area of memory between &3000 – &8000.*

I have not been able to check that this works on a B+, but providing that ACCCON is located at &FE34, I see no reason why it shouldn't. – **Andrew Steer, Stanmore, Middlesex.**

● ACCCON is indeed located at &FE34 in the B+, but its function is more limited than in the Master.

You can only control the most significant bit, which unfortunately does not allow you to switch the shadow ram into main memory.

You can only control whether or not it is currently displayed, and whether it is accessed by the MOS VDU driver.

£10 Prize letter

Multi-column fix

AS an OAP who prefers working on hard copies and wishes to save on listing paper, I have found Steve James' Multicolumn lister in the November issue of The Micro User *a godsend.*

Unfortunately most Ascii files contain embedded carriage returns (CHR$&OD) and these cause the program to format alternate short lines in blocks of text.

If PROCascii is made to ignore all single carriage returns, text and most double-spaced headings will then be printed correctly, producing a better layout, albeit at the expense of single-spaced lists and subtitles.

The revised procedure is show above. Incidentally, :P%=P%+1 *should be added to line* 1310 *to increment filed page numbers and the character before* P% *in line* 1320 *changed from* + *to* :, *and the* " *after* SPC3 *in line* 450 *removed to prevent errors.*

```
  870DEFPROCascii:IF EOF#sr
c% eof%=TRUE:ENDPROC
  875byte%=0
  880REPEAT REPEAT
  885oldbyte%=byte%
  890byte%=BGET#src%:IF byt
e%>32 AND byte%<127 word$=w
ord$+CHR$(byte%)
  900PRINTTAB(0,20)CHR$131"
PROCESSING "CHR$135;word$;S
PC(20)
  910UNTIL byte%=13 OR byte
%=32
  920IF LEN(line$)+LEN(word
$)<=colwidth% line$=line$+w
ord$:word$="":IF byte%=32 O
R (oldbyte%<>13 AND byte%=1
3) line$=line$+" "
  930IF LEN(line$)+LEN(word
$)>colwidth% PROCasciipage:
line$=word$:word$="":IF (by
te%=32 OR (oldbyte%<>13 AND
 byte%=13)) AND line$<>"" l
ine$=line$+" "
  940UNTIL ((byte%=13 AND o
ldbyte%=13) OR EOF#src%)
  950PROCasciipage:line$=""
:word$="":PROCasciipage:END
PROC
```

I avidly read every issue of The Micro User *and never cease to be amazed at the ingenuity of coding in your programs, regretting that I did not start computing early enough to be equally clever.* – **L. J. Harper, Crawley, West Sussex.**

More shadow boxing...

THE normal command for saving screen memory is:

```
*SAVE filename 3000 7FFF
```

but this obviously saves the main memory. How do I access the shadow memory?

*On the Master, I can save screens by using *FX 108,1, but screens thus saved cannot be read on the BBC B or B+. This is because the command is required again before loading the screen and both the model B and B+ lack these FX commands.*

I do not have access to a second processor, but I would also like the coding to work with such machines as well.

Another related problem is that the last byte of the screen is not saved to disc: Have I got the addresses for

LETTERS

saving correct? – **Ian Summers, Hellesdon, Norwich.**

● Most of your points have been covered in the reply to Andrew Steer, who has the same problem. However, there is no reason why shadow screens cannot be forced to load into the main memory of a model B or B+: the problem, as Mr. Steer points out, is loading the screens back into shadow memory.

As to your other point, you always have to specify one byte more than you need in a *LOAD or *SAVE command. Therefore your line should read:

```
*SAVE filename 3000 8000
```

Teletext taped

WITH reference to Mr Wright's letter in the December issue of The Micro User *he appears to have the same problem I had. If he tries the following it should help.*

The teletext system is primarily designed for disc-based systems and therefore the transmission speed of broadcast pages is too fast for a cassette system.

So after entering Teletext mode type:

```
*TAPE 3
```

*which will slow down the signals enough to make a succesful save. When you do this, don't forget to reload using *TAPE 3.*

The above is only necessary when saving text files. What I do when downloading programs is wait until the RECORD and RETURN message appears, then press Escape, the spacebar and function key f9. Then I type OLD to get the program back.

The downloaded program can then be saved using the normal method. – **L. J. Fowl, West Croydon, Surrey.**

Wrong print codes

With regard to my letter on Passing on the pauses in the December 1987 issue of The Micro User*. Unfortunately the line feed and form feed codes were transposed. The correct codes are as follows (the start of an embedded command is shown by [):*

[df[oc 13.12.19.27.58

– A.L.Gouch, Sheffield

Master works

I HAVE been looking for books on the BBC Master 128 around Oxford but have not been able to find any. I am really looking for anything to help me understand my computer's differences from the BBC B which I had previously.

I can program quite well in Basic and slightly in assembler and would be very pleased if you could send me details of any such books and where I could obtain them. – **Joel Brown (age 13), Wheatley, Oxon.**

● Watford Electronics currently stock The Master Reference Manual Parts 1 & 2, and The Master Operating System. The latter highlights differences between all the Acorn models.

Mystery character

I HAVE started typing in the utility program Macram from the December 1987 issue of The Micro User*, but I cannot recognise the character in the quotes on page 109, line 2100, and so have had to stop.* – **Andrew Bryant, Camberley, Surrey.**

● The character you want is called a bar, and is obtained by Shift+| next to the left cursor key.

Well done

When a fault developed in the disc drives I had bought from Watford Electronics I was apprehensive about sending them back, having heard and read so many horror stories regarding levels of after-sales service and extended repair times of many companies.

However, I shouldn't have worried as they were returned within a week.

They were handed in to Securicor in Aberdeen on Thursday, October 29 at 5.40 pm and were delivered back to my house on Wednesday, November 4, after a round trip of 1000 miles. How's that for service?

Thank you Watford and Securicor. – **Mr. T. J. D. Erskine, Ardoe, Aberdeen.**

Archimedes twist

£10 Prize letter

I WAS staring at the word Archimedes in the desperate hope that I would come to understand the idea better, when I realised that the letters could be arranged to read:

```
He made RISC.
```

Something, at last, was beginning to stick in my mind. Spurred on by this momentary understanding I noticed that you can also make the following:

```
I'd chase REM.
```

and:

```
Me hear disc.
```

Obviously someone like myself was at an early stage of computer literacy. Finally I came across the interesting sentence:

```
She iced ram.
```

I am not absolutely sure this has really brought me any closer to a full appreciation of the wonderful new machine – but perhaps it throws a little light on things. – **John Maxwell, Harrow, Middlesex.**

● You've got a point – there's more to this than meets the eye. Like the ominous *ARC HIDES ME* or puzzling *I MESHED ARC* to the downright strange *I HAD CREMES*! Maybe our astute readers will help us to delve further into this mystery.

Locating the missing links

HOW can I print a number (in assembly language) from location LOC *to the screen? At present all I can do is output characters.*

Also I have heard about keyboard links which make the computer boot up at switch-on, and speed up the disc drive. I own an issue 7, OS 1.2 BBC B and can find no such links. Where are they?

I am considering selling my BBC B, and buying a Master 128. As I have yet to find a full specification list, could you clear up a few points? Does it have sprites, can it mix colours like the GXR rom and is the sideways ram easily accessible? – **Nigel Garnett, Darlinston, Co. Durham.**

● Starting with your first question, to output a binary number as decimal is fairly simple. The following short piece of code will output any 8 bit number passed in the accumulator as decimal, with leading spaces printed:

```
 10MODE7:num=&70
 20hund=&71:tens=&72
 30FORpass=0TO3STEP3
 40P%=&900:[OPT pass
 50STA num:LDA #0
 60STA hund
 70.hundloop
 80SEC:LDA num:SBC #100
 90BCC dotens:STA num
100INC hund:JMP hundloop
110.dotens
120LDA #0:STA tens
130.tenloop
140SEC:LDA num:SBC #10
150BCC printnum:STA num
160INC tens:JMP tenloop
170.printnum
180CLC:LDA hund:ADC #48
190JSR &FFEE:LDA tens
200ADC #48:JSR &FFEE
210LDA num:ADC #48
220JMP &FFEE
230]:NEXT
```

Type it in and run it. To test it out, set *A%* to any 8 bit value and CALL &900.

The keyboard links should be near the bottom right of your keyboard PCB. See the Advanced User Guide for details of their usage.

As for the Master 128, you

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LETTERS

◀ *From Page 161*

will find everything you need to know in the March 1986 issue of *The Micro User*, in which Mike Cook gave the machine a thorough review.

Briefly though, it has no built-in sprites; no BBC Micro except the Archimedes does unless you buy Acornsoft's Sprite Rom, or write your own routines to do this.

It can indeed mix colours, in fact its graphics facilities far exceed the GXR Rom. And finally, the sideways ram is fully supported by a nice set of easy-to-use star commands.

Faster rom loading

IN the December issue of The Micro User *G. Dobson gave a routine for loading roms into sideways ram using a !BOOT file.*

The B+, Master and Compact all have the optional parameter Q to speed up loading a rom to sideways ram. This uses the memory between PAGE and the screen memory as a buffer.

The routine as published will work, albeit quite slowly, so to speed it up it could be re-written as follows:

```
1 *SRLOAD ROM1 8000 W Q
2 *SRLOAD ROM2 8000 X Q
3 *SRLOAD ROM3 8000 Y Q
4 *SRLOAD ROM4 8000 Z Q
5 ?&2AD=&87
6 ?&2AE=&87
7 ?&2A1=&C2
8 ?&2A2=&C2
9 CH."PROGRAM"
```

Using the Q parameter makes the rom being loaded overwrite the main memory, but this is not a problem if you haven't loaded your program yet.

Also there is a quicker way of initialising the roms as shown in lines 5 to 8 above. You poke ?&2A<rom number +1> with &82 for a service rom or &C2 for a language. – **V. Marks, Mexborough, South Yorks.**

● While you can initialise roms in this way, it is very risky if they need to grab some private ram. If this is the case you'll have to use Control+Break to initialise them properly.

Compact addresses

BRUCE GOATLY'S program Address Book from the August 1987 issue is excellent and can be adapted for use in many ways. However, there is one small problem that appears as you are adding records to the Address file and using the select to disc facility.

*Each time you load the program it deletes the previous Select file, and the new Select file cannot fit into the same slot on the disc. The answer I have found is to *COMPACT regularly.* – **Mr. T. M. Warrilow**

Finding Musbury

IN answering a letter regarding a sound sampler in the November '87 issue, you stated that a photocopy of the PCB is available from Musbury Consultants, but no address was given. I would be most grateful if you could supply it – **Mr. M. Scott, Newcastle.**

● The address for Musbury Consultants is 8, Fairhill, Helmshore, Rossendale, Lancs BB4 4JX, and can also be found at the foot of any of Mike Cook's Body Building articles.

MicroLink features

I AM considering joining MicroLink for use in my business. My main reason for wanting to join is that electronic mail can be any length, rather than the restrictive frame sizes of other online services. But are there any other features I would find useful? – **A. Fielding, Sheffield, Yorkshire.**

● There are many features of MicroLink useful for companies and the following are just a few examples.

Telemessages: This is a service exclusive to MicroLink where a letter keyed into your micro before 8pm is guaranteed delivery first post the next day.

Telex: As with the MicroLink Email service there is no limit to the length of a document sent by Telex so this gives a cheap, efficient way of using the Telex system.

Company status: There are three different information suppliers on MicroLink who can give an instant check on a company's credit rating.

Background research: If you remember seeing a story about a company you want to deal with but can't remember the details, you can key into World Reporter and should be able to trace the story and print it out.

Which computer?

I AM considering buying a home computer and I wonder if you would give me some advice.

I have a fairly large collection of LPs and tapes, which I would like to catalogue on it with cross-reference to tracks and artists.

Can you suggest suitable software and the most suitable micro to do this? I am told I will need a disc drive for quick retrieval of information. – **John M. Neal.**

● You should find that a BBC Micro with a disc drive, and either the disc or rom version of Mini-Office II from Database Software, will suit your needs.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

No safe hiding place?

WITH reference to the disc protection programs published in the April 1987 issue of The Micro User, *I find that there is one aspect of protection not covered.*

*Since the programs still exist on the disc in their usual forms they can be examined with a utility like Disc Doctor's *DZAP and can therefore be loaded into the computer's memory with *RECOVER, and re-saved as a normal file.*

If Chris Nixon can come up with a solution to protect the program from disc sector editor users, myself included, I would feel more confident that my programs were protected from prying eyes, thus foiling their recovery by pirates. – **B. J. Thompson, Sandiacre, Nottingham.**

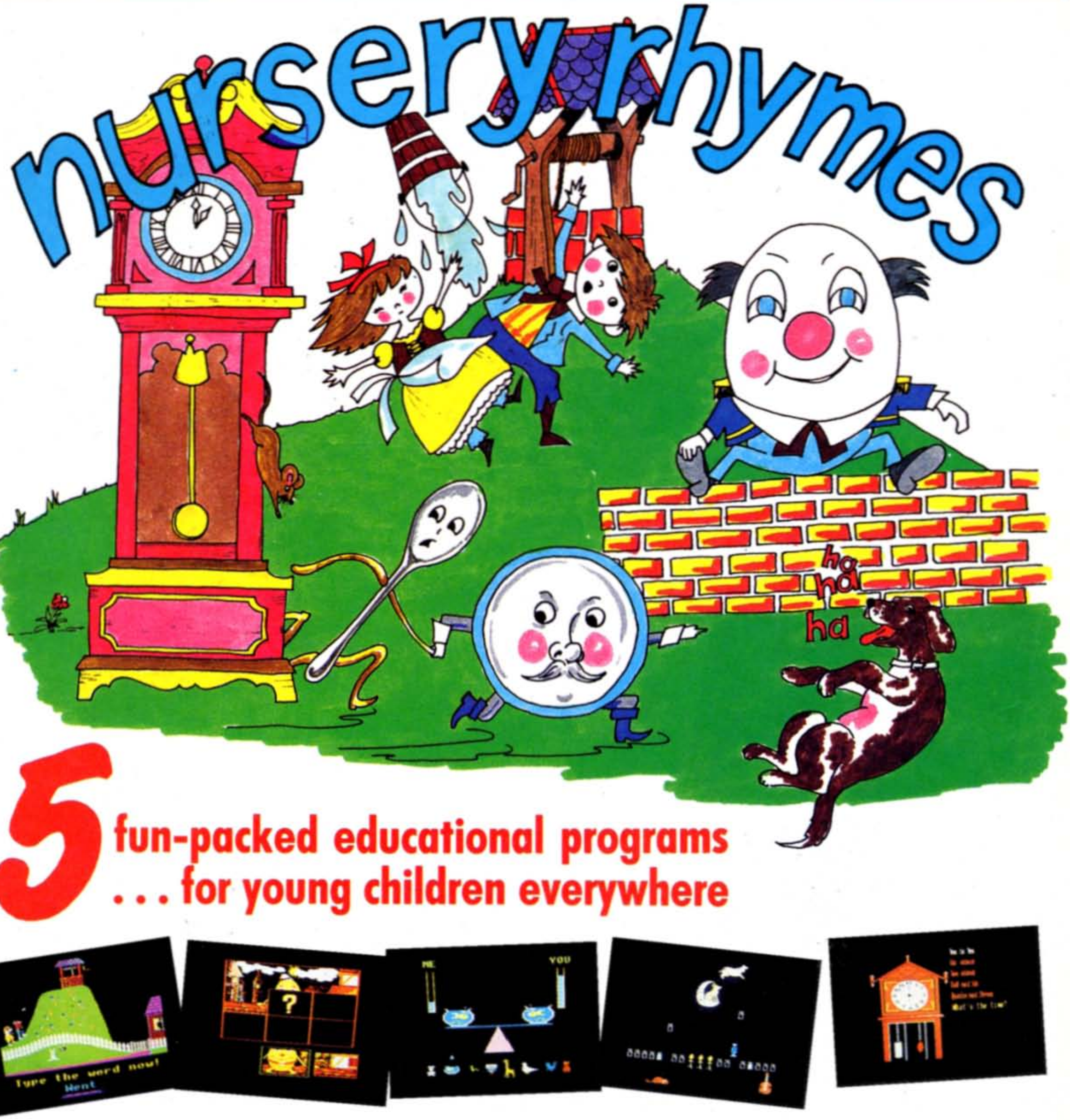
● **Chris Nixon replies:** A mark II version of my disc protection system is planned for a future issue, and rest assured it will render your programs completely unreadable by any means whatsoever.

Citizen screen dumps

I HAVE recently bought a Citizen 120D printer but am not able to dump graphics I have created. Could you tell me whether it is possible to do this, or whether I need to buy a screen dump program?

If the latter is the case, is there any particular program that The Micro User *would recommend for a relative beginner in this field?* – **Terry Butler, Burton on Trent, Staffs.**

● We consulted Citizen and they said that the 120D is fully Epson-compatible, and therefore any Epson screen dump program should solve your problems. Technomatic's Dumpmaster rom should fit the bill.



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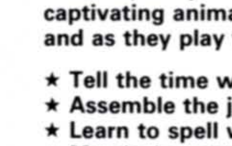

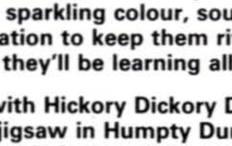

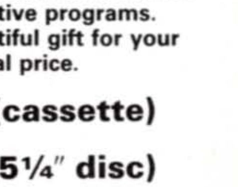

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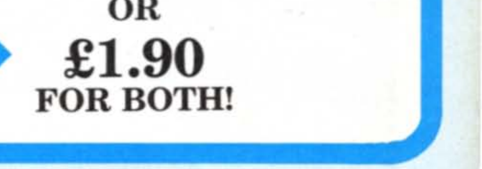
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(see page 163)

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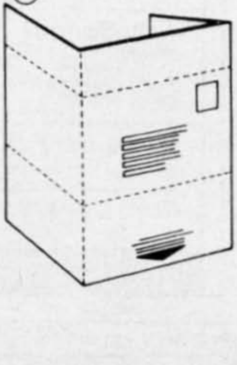

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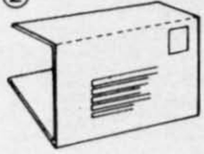

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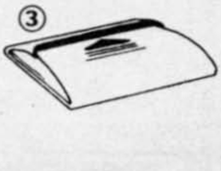

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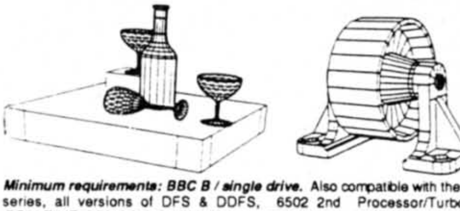

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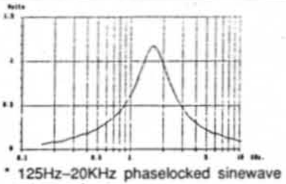

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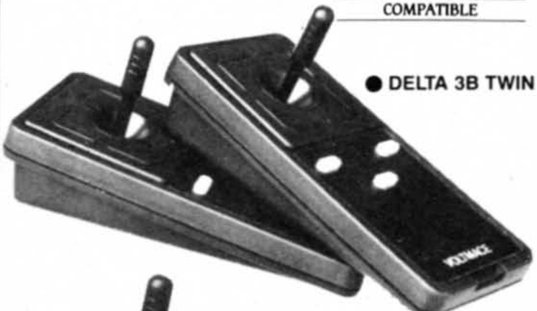

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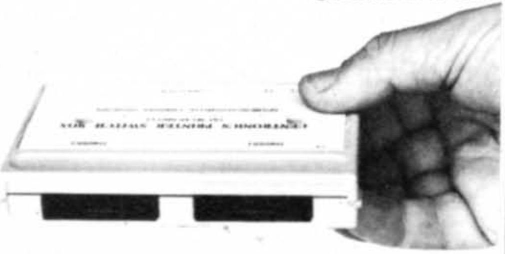

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REPTON AS A BABY

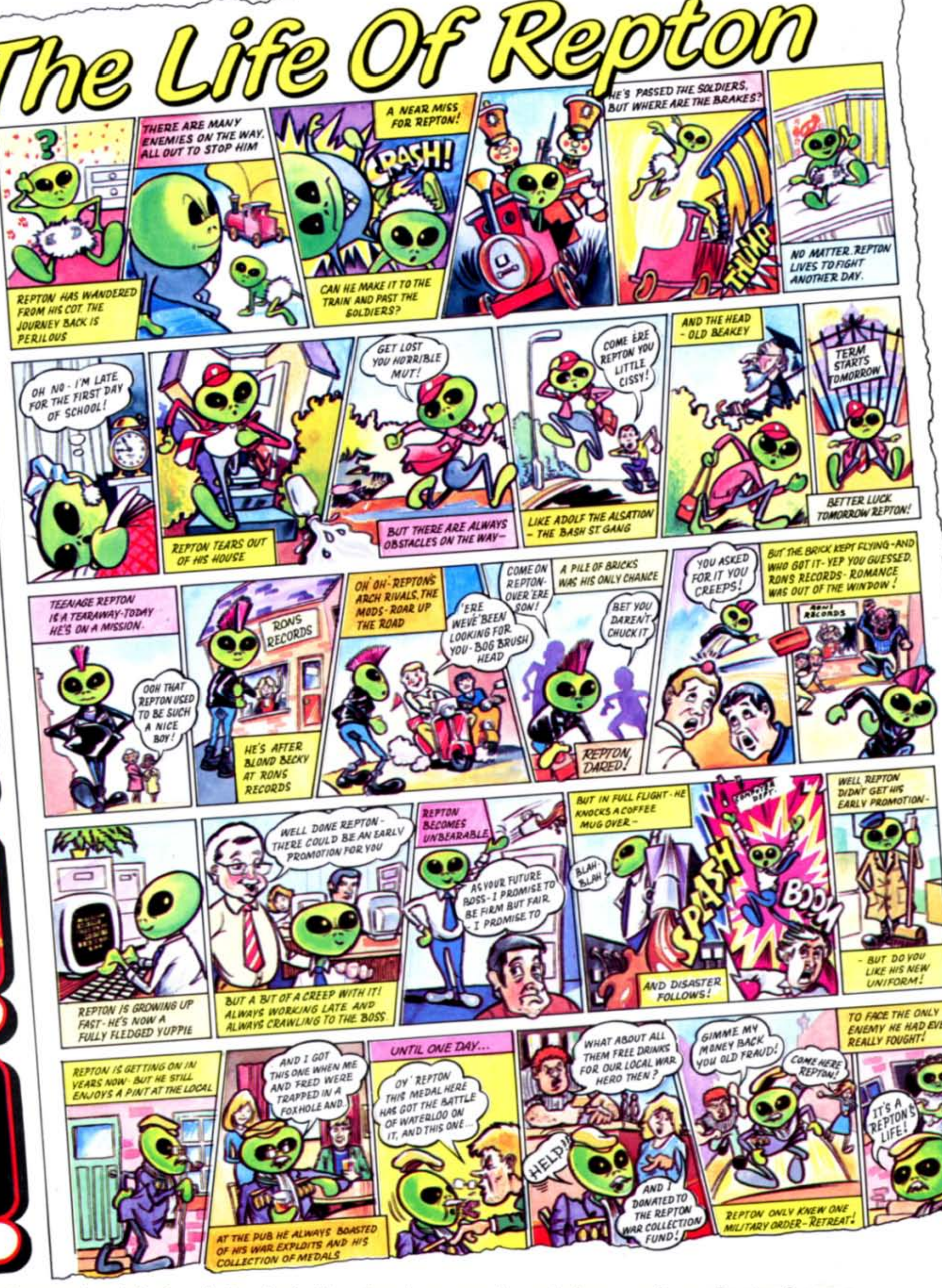
REPTON AT SCHOOL

REPTON AS A TEENAGER

REPTON AT WORK

REPTON AS AN OLD MAN

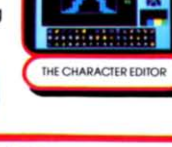
The Life Of Repton


THERE ARE MANY ENEMIES ON THE WAY. ALL OUT TO STOP HIM
REPTON HAS WANDERED FROM HIS COT. THE JOURNEY BACK IS PERILOUS
A NEAR MISS FOR REPTON!
CRASH!
CAN HE MAKE IT TO THE TRAIN AND PAST THE SOLDIERS?
HE'S PASSED THE SOLDIERS, BUT WHERE ARE THE BRAKES?
THUMP
NO MATTER. REPTON LIVES TO FIGHT ANOTHER DAY.
OH NO - I'M LATE FOR THE FIRST DAY OF SCHOOL!
REPTON TEARS OUT OF HIS HOUSE
GET LOST YOU HORRIBLE MUT!
BUT THERE ARE ALWAYS OBSTACLES ON THE WAY—
COME 'ERE REPTON YOU LITTLE CISSY!
LIKE ADOLF THE ALSATION - THE BASH ST GANG
AND THE HEAD - OLD BEAKEY
TERM STARTS TOMORROW
BETTER LUCK TOMORROW REPTON!
TEENAGE REPTON IS A TEARAWAY-TODAY HE'S ON A MISSION.
OOH THAT REPTON USED TO BE SUCH A NICE BOY!
RONS RECORDS
HE'S AFTER BLOND BECKY AT RONS RECORDS
OH' OH'- REPTON'S ARCH RIVALS, THE MODS - ROAR UP THE ROAD
'ERE WE'VE BEEN LOOKING FOR YOU - BOG BRUSH HEAD
COME ON REPTON - OVER 'ERE SON!
A PILE OF BRICKS WAS HIS ONLY CHANCE
BET YOU DAREN'T CHUCK IT
REPTON, DARED!
YOU ASKED FOR IT YOU CREEPS!
BUT THE BRICK KEPT FLYING - AND WHO GOT IT - YEP YOU GUESSED. RONS RECORDS - ROMANCE WAS OUT OF THE WINDOW!
RONS RECORDS
REPTON IS GROWING UP FAST - HE'S NOW A FULLY FLEDGED YUPPIE
WELL DONE REPTON - THERE COULD BE AN EARLY PROMOTION FOR YOU
BUT A BIT OF A CREEP WITH IT! ALWAYS WORKING LATE AND ALWAYS CRAWLING TO THE BOSS.
REPTON BECOMES UNBEARABLE
AS YOUR FUTURE BOSS - I PROMISE TO BE FIRM BUT FAIR - I PROMISE TO
BUT IN FULL FLIGHT - HE KNOCKS A COFFEE MUG OVER—
BLAH-BLAH
COMPUTER DEPT.
SPASH
BOOM
AND DISASTER FOLLOWS!
WELL REPTON DIDN'T GET HIS EARLY PROMOTION—
- BUT DO YOU LIKE HIS NEW UNIFORM!
REPTON IS GETTING ON IN YEARS NOW - BUT HE STILL ENJOYS A PINT AT THE LOCAL
AND I GOT THIS ONE WHEN ME AND FRED WERE TRAPPED IN A FOXHOLE AND..
AT THE PUB HE ALWAYS BOASTED OF HIS WAR EXPLOITS AND HIS COLLECTION OF MEDALS
UNTIL ONE DAY...
OY' REPTON THIS MEDAL HERE HAS GOT THE BATTLE OF WATERLOO ON IT, AND THIS ONE...
WHAT ABOUT ALL THEM FREE DRINKS FOR OUR LOCAL WAR HERO THEN?
HELP!!
AND I DONATED TO THE REPTON WAR COLLECTION FUND!
GIMME MY MONEY BACK YOU OLD FRAUD!
COME HERE REPTON!
REPTON ONLY KNEW ONE MILITARY ORDER - RETREAT!
TO FACE THE ONLY ENEMY HE HAD EVER REALLY FOUGHT!
IT'S A REPTON'S LIFE!

Repton fans have begged, cajoled and pleaded with us to release another set of screens for our Repton 3 game. How could we refuse? Our lovable hero returns again to star in 40 new screens that vividly depict Repton's life-story.

The Five Ages of Repton:— At first we see Repton as a baby: a mewling infant surrounded by teddy-bears, humpty-dumptys, and aggressive clockwork toy-soldiers. Then Repton is a whining school-boy, creeping like snail unwillingly to school, with his pens, his calculator, and a bundle of homework. And then Repton during his teenage years becomes a spikey-haired punk armed with a ghetto-blaster and a collection of records. Then Repton goes to work: we see a harried office-manager amidst computers, photocopiers, and endless cups of coffee. Last scene of all, that ends this strange eventful history, is Repton as an old-age pensioner searching for his false-teeth, his spectacles, his "pint of stout", and his well-polished war-medals.

THE SCREEN EDITOR



THE CHARACTER EDITOR

Each copy of The Life Of Repton includes:
- the Repton 3 main program
- the Repton 3 editor and
- the 40 new game screens

BBC Micro Cassette	£6.95	Acorn Electron Cassette	£6.95
BBC Micro 5¼" Disc	£7.95	Acorn Electron 5¼" Disc	£7.95
BBC Master Compact 3½" Disc	£9.95		

(Compatible with the BBC B, B+ and Master Series computers).
The screen pictures show the BBC Micro version of the game.

PRIZE COMPETITION

If you complete all 40 screens of The Life of Repton, you can enter our competition. Prizes include £200 in cash, with Repton mugs, badges, pens and certificates for runners-up.

Closing Date: 30th June 1988.

SUPERIOR SOFTWARE Limited

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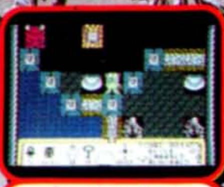
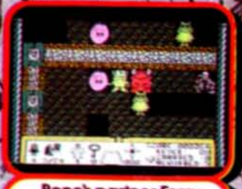
BONE CRUNCHER



Bono takes the skeletons to a cauldron



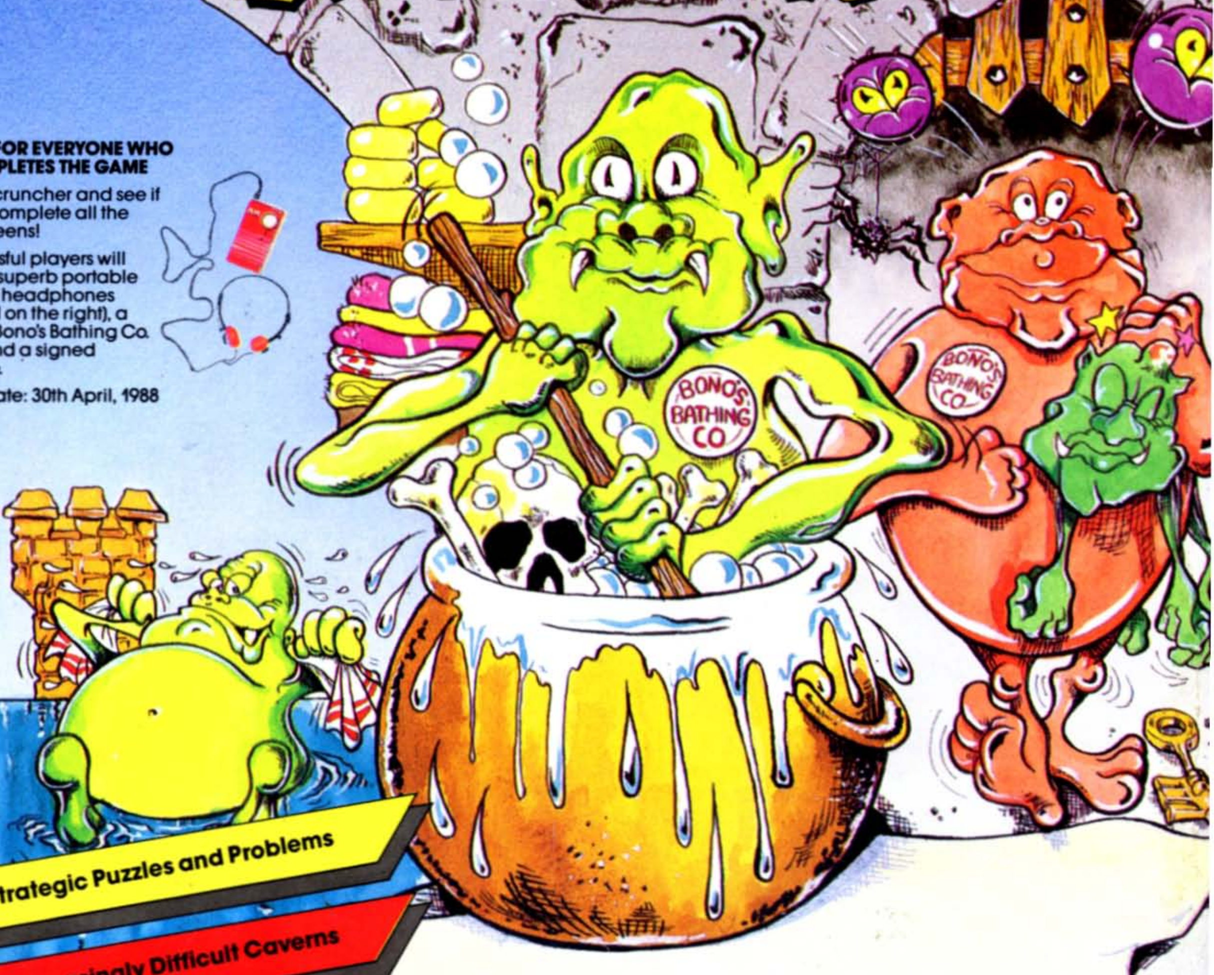
Bono's partner Fozzy restrains a monster

A PRIZE FOR EVERYONE WHO COMPLETES THE GAME

Buy Bonecruncher and see if you can complete all the game screens!

All successful players will receive a superb portable radio with headphones (illustrated on the right), a colourful Bono's Bathing Co. badge, and a signed certificate.

Closing Date: 30th April, 1988



- Full of Strategic Puzzles and Problems
- Over 20 Increasingly Difficult Caverns
- Password Feature helps you to Progress
- Prize Competition for Skilled Players
- Humorous, Witty, a Barrel of Laughs

Bono The Dragon and his Flourishing Business

You are Bono, a friendly dragon residing in a picturesque sea-castle. As a shrewd business-dragon, keen on "nice little earners", you make your living by selling soap to the giant monsters who bathe in the sea surrounding the castle.

With the aid of your business partner, named Fozzy, you produce the soap by collecting skeletons amongst the castle caverns and then boiling the bones in a cauldron.

However, the castle caverns are fraught with danger: there are monsters who will kill you, spiders who will eat you alive, and glooks who will block your path. It will pay you dividends to also avoid the perilous trapdoors and hidden volcanoes.

A soap-opera not to be missed!

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